Curriculum overview

Subject	Computing	Year group	9
Vision statement:	At Landau Forte our curriculum exists to ensure all students regardless of background and ability have the opportunity to unlock their potential. We are committed to students being challenged from their previous key stage learning experiences. Our broad and balanced curriculum is ambitious, coherently planned and sequenced, and will provide the platform for preparing students with the foundations for examination success. Our Curriculum Intent has been informed by a wide variety of researchers and is steeped in evidence based research. Christine Counsell summarises the aspiration of our curriculum to empower all learners creating a pathway to success in university, their career and life: *'A curriculum exists to change the pupil, to give the pupil new power. One acid test for a curriculum is whether it enables even lower attaining or disadvantaged pupils to clamber into the discourse and practices of educated people, so that they gain powers of the powerful.'* As well as excellent academic success we aim to ensure our students leave us as polite and well-rounded young adults. Our new core values of Compassion, Courage and Curiosity are currently being embedded throughout our curriculum offer to ensure we continue to meet our social, emotional, spiritual and moral obligations.		
Curriculum intent:	Computing will be central to everything students do in their future lives. This subject gives students the opportunity to utilise technology to enhance the way they live and work. It will also be used as a lens to develop their understanding of the world around them. ***In essence, computing should be seen as an underpinning subject that facilitates new learning and thinking in all other areas. The computer should be a tool that pupils use in the same way as a calculator or a pen.*** As outlined within the National Curriculum: "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 students 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, students are equipped to use **information technology** to create programs, systems and a range of content. Computing also ensures that students 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. The need to use technology with care and compassion should be considered throughout all lessons.		

Threshold Concepts (TCs):	1. We can solve any problem in different ways using combinations of computational thinking techniques: abstraction, decomposition, pattern recognition and algorithms 2. Computers represent everything as sets of binary codes that can mean different things at different times 3. Everything you do online builds up a profile about you and your behaviours and can be exploited 4. Humans understand complex sets of information easily when pictures are used 5. Computers control physical devices in the same way that they display programs on a screen 6. We don't always have to tell a computer exactly every step of how to solve a problem
KS2 National Curriculum summary:	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. Pupils should be taught to: • design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts • use sequence, selection, and repetition in programs; work with variables and various forms of input and output • use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs • understand computer networks, including the internet; how they can provide multiple services, such as the World Wide Web, and the opportunities they offer for communication and collaboration • use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content • select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information • use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact
Learner skills:	 CRITICAL THINKING  ORACY  COLLABORATION  SELF QUIZZING  ADAPTABILITY  ORGANISATION

CURIOSITY COMPASSION COURAGE

	Term 1 Aug-Oct	Term 2 Nov-Dec	Term 3 Jan-Feb	Term 4 Mar-Apr	Term 5 Apr-May	Term 6 Jun-Jul
The Big Question	**How do we improve on what we do with computers?**					
Big picture questions:	**How do we get computers to complete millions of tasks in a second?**	**How can we improve the quality of images and sound stored in a computer?**	**What threats are there in the online world?**	**How do we make decisions using vast quantities of data?**	**How can we tell a story on a computer?**	**How can computers control things in the real world?**
Content (Linked to TCs):	TC1 • How to write programs that display messages, receive keyboard input, and use simple arithmetic expressions in assignment statements • How to use selection (if-elif-else statements) to control the flow of program execution • How to locate and correct common syntax errors • How to create lists and access individual list items • How to perform common operations on lists or individual items • How to use iteration (while statements) to control the flow of program execution • How to perform common operations on lists or individual items	TC2 • That digital images are composed of individual elements represented as a sequence of binary digits • How colour can be represented as a mixture of red, green, and blue • How to compute the representation size of a digital image • What the trade-offs between representation size and perceived quality for digital images are • How to perform basic image editing tasks using appropriate software • How the manipulation of digital images amounts to arithmetic operations • What the creative benefits and ethical drawbacks of digital manipulation are	TC3 • The difference between data and information • How to critique online services in relation to data privacy • What happens to data entered online • Why the Data Protection Act is needed • How human errors pose security risks to data • How to implement strategies to minimise the risk of data being compromised through human error • What hacking is in the context of cyber security • How a DDoS attack can impact users of online services • What strategies to use to reduce the chance of a brute force attack being successful	TC4 • What data science is • How visualising data can help identify patterns and trends in order to help us gain insights • How to use an appropriate software tool to visualise data sets and look for patterns or trends • Where large data sets are used in daily life • How to select criteria and use data set to investigate predictions • How to evaluate findings to support arguments for or against a prediction • What the terms 'correlation' and 'outliers' are in relation to data trends • The steps of the investigative cycle	TC5 • How to add, delete, and move objects • How to scale and rotate objects • How to use a material to add colour to objects • How to add, move, and delete keyframes to make basic animations • How to play, pause, and move through the animation using the timeline • How to create useful names for objects • How to join multiple objects together using parenting • How to use edit mode and extrude • How to use loop cut and face editing • How to apply different colours to different parts of the same model • How to use proportional editing	TC6 • Describe what the micro:bit is • List the micro:bit's input and output devices • Use a development environment to write, execute, and debug a Python program for the micro:bit • Write programs that use the micro:bit's built-in input and output devices • Write programs that use GPIO pins to generate output and receive input • Write programs that communicate with other devices by sending and receiving messages wirelessly • Design a physical computing artifact purposefully, keeping in mind the problem at hand, the needs of the

	• How to perform common operations on strings or individual characters • How to use iteration (for statements) to iterate over list items • How to perform common operations on lists or strings • How to use iteration (for loops) to iterate over lists and strings • How to use variables to keep track of counts and sums • How to combine key programming language features to develop solutions to meaningful problems	• The concept of sound as a wave • What the function of microphones and speakers are as components that capture and generate sound • How sounds are represented as sequences of bits • How to calculate representation size for a given digital sound, given its attributes • What trade-offs are involved when adjusting the quality of sound data • How to perform basic sound editing tasks using appropriate software • What 'compression' is and describe why it is necessary	• Why the Computer Misuse Act is needed • What common malware threats there are • How different types of malware causes problems for computer systems • How malicious bots can have an impact on societal issues • How to compare security threats against probability and the potential impact to organisations • How networks can be protected from common security threats • What the most effective methods to prevent cyberattacks are	• How to solve a problem by implementing steps of the investigative cycle on a data set • How to use findings to support a recommendation • How to identify the data needed to answer a question defined by the learner • How to create a data capture form • What the need for data cleansing is • How to apply data cleansing techniques to a data set • How to visualise a data set • How to analyse visualisations to identify patterns, trends, and outliers • How to draw conclusions and report findings	• How to use the knife tool • How to use subdivision • How to add and edit set lighting • How to set up the camera • How to use different render modes • How to create a 3–10 second animation • How to render out the animation	audience involved, and the available resources • Decompose the functionality of a physical computing system into simpler features • Implement a physical computing project, while following, revising, and refining the project plan

Vocabulary Instruction:	Input, output, variables, assignment, expressions, selection, Boolean/logical expression (condition), list, index, list item, list operations (append, insert, pop, remove, index, count, reverse, sort, length), list membership, Boolean/logical expression (condition), iteration, string operations	Digital image, binary image representation, picture elements, pixels, resolution, colour depth, bitmap or raster images, RGB colour, representation size, compression, image editing functions, sound, waves, microphone, speaker, analogue, digital, digitisation, digital sound representation, sampling rate, sample size, channels, representation size, trade-offs, sound editing, symbolic representations	Data, information, cybersecurity, cybercriminals, profiling, user behaviour, privacy policies, data protection, data subject, data portability, malware, social engineering, phishing, blagging, shouldering, name generator attack, scam, hacking, ethical, penetration testing, script kiddies, flooding, brute force, ransomware, malware, viruses, trojans, worms, adware, spyware, bots, botnet, anti-malware, firewall, end-user authentication, folder permissions/privileges, botnet, trojans, biometrics, two-factor authentication (2FA), CAPTCHA, Internet Service Provider (ISP), auto-updates	Data science, visualisation, insight, infographic, data, prediction, criteria, outliers, correlation, PPDAC, investigative cycle, investigative cycle, data capture, data source, analysis, data cleansing, conclusion, visualisation	Object, sphere, cone, add, move, rotate, scale, colour (material), keyframe, tweening, stop motion, object, animation, location, timeline, parenting, edit mode, scale, extrude, loop cut, face, edge, vertex, proportional editing, knife tool, organic, subdivision, render, lights, camera, focus, ray tracing	Input, output, sensors, hardware components, selection, iteration, expressions, lists, pins, circuits, wireless, project, design, problem, audience, prototype, decomposition, processing, audience, prototype
Assessment:	Knowledge check Topic test	Knowledge check Topic test	Knowledge check Topic test **Summative Assessment 1**	Knowledge check Topic test	Knowledge check Topic test	Knowledge check Topic test **Summative Assessment 2**

Key/Historical misconceptions in this unit:	Loops are defined with a set number of repetitions in mind. It is more useful to determine repetition by determining if an end goal has been reached.	Data stored digitally in a computer is automatically better than previous analogue modes of data storage. Highest quality is always 'best'.	Viruses are the biggest threat to the security of IT systems. As long as you are careful, there are no dangers of using computers online.	You can't make sense of pages of numerical data. If we collect data ourselves, it is immediately useful.	Animation has to be done frame by frame. It is difficult to produce high quality visual animations.	It is a complex operation to interface a program with physical devices.
Sequencing:	**We have chosen to sequence the year 9 curriculum like this because…** All three aspects of computing, (digital literacy, IT, computer science,) are now at the stage where students are able to use their knowledge and skills to create new and improved solutions to their work. Again key programming skills bookend the start and the ned of the year built up from experiences in previous years. The context for these skills is kept deliberately different so that students can appreciate how what they have learnt can be applied to a variety of situations. Term 2 covers a computer science topic to enable those choosing options at this time to understand the decisions they often need to make. Similarly, the cybersecurity unit in term 3 and the data science unit in term 4 provides crossover between IT and computer science. Students need to appreciate that what they are learning can have implications for the work they do with computers with a focus on doing what they can to improve the work they do in the real world. Term 5's animation unit provides an insight in to more advanced aspects of computer use in the context to media that they find familiar.					
Values	**This scheme of work promotes the school values of Compassion, Curiosity and Courage by:** *Compassion:* Students begin to understand the risk that use of technology poses. They recognise that the safe use of technology is the responsibility of all and that by the choices they make their actions influence others. *Curiosity:* Students understand the power of programming. With programs they can control devices to perform many different tasks and it is only their imagination that is the limiting factor. *Courage:* Students need to be resilient. They understand that work is never straight-forward and that, to do well, they will need to attempt things many times. If they can develop these skills and abilities they will develop their independence and be able to solve problems on their own using the resources available to them.					
National Curriculum plus:	**In addition to teaching the statutory elements of the national curriculum, we also include** Many learners choosing their options this year like to appreciate the links between subjects and what they might do in the real world of work. They also like to consider how combinations of subjects work together to achieve their life goals. In all units this year we highlight the links between computing and other subjects, especially the ways in which the subject is used to enhance what can be achieved.					