

Computing 1: Computer Systems

U1	<ul style="list-style-type: none"> <input type="checkbox"/> G: I know how to create strong passwords <input type="checkbox"/> G: I know how to stay safe online and how to alert an adult if I am worried about anything <input type="checkbox"/> G: I can list a range of devices <input type="checkbox"/> SA: I can state what the CPU is <input type="checkbox"/> M: I can recall what RAM and ROM stand for <input type="checkbox"/> SSw: I can state what a web browser is, and provide examples
U2	<ul style="list-style-type: none"> <input type="checkbox"/> G: I can state what hardware is (including the difference between input and output devices) <input type="checkbox"/> SA: I can identify a CPU on an image or real life example <input type="checkbox"/> SSw: I can state what software is <input type="checkbox"/> WAWN: I can state what a network is <input type="checkbox"/> NTPL: I can state what WiFi is in simplistic terms <input type="checkbox"/> SSw: I can explain the difference between a web browser and a search engine, with examples
U3	<ul style="list-style-type: none"> <input type="checkbox"/> G: I can explain the difference between hardware and software with examples <input type="checkbox"/> G: I can identify the parts of a computer <input type="checkbox"/> ST: I can state what secondary storage is <input type="checkbox"/> WAWN: I can state the difference between a wired and a wireless network <input type="checkbox"/> NTPL: I can state what a topology is <input type="checkbox"/> SSy: I can state what a virus is <input type="checkbox"/> SSw: I can state what OS stands for
1	<ul style="list-style-type: none"> <input type="checkbox"/> M: I can state the difference between RAM and ROM <input type="checkbox"/> ST: I can remember the names used for storage capacities <input type="checkbox"/> WAWN: I can remember what WAN (wide area network) and LAN (local area network) stand for <input type="checkbox"/> NTPL: I am aware of traditional topologies such as Bus and Ring <input type="checkbox"/> NTPL: I can state what an Ethernet is <input type="checkbox"/> SSw: I can state what an OS is and give examples <input type="checkbox"/> SSw: I can state what system software is
2	<ul style="list-style-type: none"> <input type="checkbox"/> M: I can outline the difference between primary and secondary storage <input type="checkbox"/> ST: I can state the need for secondary storage <input type="checkbox"/> ST: I can remember the storage capacities in order <input type="checkbox"/> ST: I can describe the following common secondary storage types with examples; optical, magnetic and solid state <input type="checkbox"/> WAWN: I can describe what a WAN (wide area network) and LAN (local area network) are <input type="checkbox"/> NTPL: I can draw or illustrate Star and Mesh topologies <input type="checkbox"/> SSw: I can outline the purpose and functionality of systems software <input type="checkbox"/> ELCEC: I can describe what open source and proprietary software is and explain the differences between them
3	<ul style="list-style-type: none"> <input type="checkbox"/> SA: I can describe the purpose of the CPU <input type="checkbox"/> M: I can describe the purpose of ROM in a computer <input type="checkbox"/> M: I can describe the purpose of RAM in a computer <input type="checkbox"/> ST: I can select suitable storage devices and storage media for a given application <input type="checkbox"/> ST: I can explain the advantages and disadvantages of storage media, with reference to; capacity, speed, portability, durability, reliability and cost <input type="checkbox"/> NTPL: I can explain how star and Mesh topologies work with the use of diagrams <input type="checkbox"/> NTPL: I can explain how WiFi works, with reference to frequency channels and encryption <input type="checkbox"/> SSy: I can explain how networking computers can increase the security risk to computers on those networks <input type="checkbox"/> ELCEC: I can describe issues around Computer Science technologies while considering; ethical issues, legal issues, cultural issues, environmental issues and privacy issues

KEY:

4	<ul style="list-style-type: none"> <input type="checkbox"/> SA: I can describe how the CPU functions as fetch and execute instructions stored in memory <input type="checkbox"/> M: I can describe what virtual memory is and why it is required <input type="checkbox"/> M: I can describe what flash memory is and why it is required <input type="checkbox"/> ST: I can calculate data capacities and data capacity requirements <input type="checkbox"/> WAWN: I can identify and describe what hardware is required to connect a standalone computer to a Local Area Network; wireless access points, routers, switches, NIC (network interface controller/card), transmission media <input type="checkbox"/> SSy: I can explain what malware is and what typical actions can include, along with how they access files <input type="checkbox"/> SSw: I can describe fully what an Operating System with particular reference to; user interface, memory management and multitasking, peripheral management and drivers, user management and file management <input type="checkbox"/> ELCEC: I can explain how key stakeholders are affected by technologies <input type="checkbox"/> ELCEC: I can explain the environmental impact of Computer Science <input type="checkbox"/> ELCEC: I can discuss the cultural implications of Computer science
5	<ul style="list-style-type: none"> <input type="checkbox"/> SA: I can explain how the following characteristics affect CPU performance; clock speed, cache size and the number of cores <input type="checkbox"/> WAWN: I identify and describe the factors that affect the performance of networks <input type="checkbox"/> SSy: I can identify and describe the type of attacks on networks <input type="checkbox"/> SSy: I can describe the following threats to networks; malware, phishing, people as the weak point in secure systems, brute force attacks, denial of service attacks, data interception and theft, the concept of SQL injection, poor network policy <input type="checkbox"/> SSw: I can describe the purpose and benefits of utility system software with particular reference to; encryption software, defragmentation software, data compression, the role and methods of backup (full and incremental) <input type="checkbox"/> ELCEC: I can investigate and discuss Computer Science technologies while considering; ethical issues, legal issues, cultural issues, environmental issues and privacy issues
6	<ul style="list-style-type: none"> <input type="checkbox"/> SA: I can explain what an embedded system is, and I can provide examples as part of that explanation <input type="checkbox"/> WAWN: I can explain how the internet functions as a worldwide collection of networks using the following key terminology; DNS (domain name server) hosting and the cloud <input type="checkbox"/> NTPL: I can explain IP addressing, MAC addressing and what protocols are, including; TCP/IP (Transmission Control Protocol/Internet Protocol), HTTP (Hyper Text Transfer Protocol), HTTPS (Hyper Text Transfer Protocol Secure), FTP (File Transfer Protocol), POP (Post Office Protocol), IMAP (Internet Message Access Protocol), SMTP (Simple Mail Transfer Protocol) <input type="checkbox"/> ELCEC: I can explain and know how to apply the legislation relevant to Computer Science, including; The data protection act 1998, Computer Misuse Act 1990, Copyright Designs and Patents Act 1988, Creative Commons Licensing and the Freedom of Information Act 2000
7	<ul style="list-style-type: none"> <input type="checkbox"/> SA: I can explain what the common CPU components are and their function including the ALU (Arithmetic Logic Unit), CU (Control Unit) and Cache <input type="checkbox"/> WAWN: I can explain fully the concept of virtual networks <input type="checkbox"/> NTPL: I can fully explain how packet switching is used to direct data
8	<ul style="list-style-type: none"> <input type="checkbox"/> SA: I can explain what the Von Neumann architecture is using the MAR (Memory Address Register), MDR (Memory Data Register), Program Counter and Accumulator <input type="checkbox"/> NTPL: I can fully explain the concept of layers <input type="checkbox"/> SSy: I can explain how to identify and prevent vulnerabilities to networks, including; penetration testing, network forensics, network policies, anti-malware software, firewalls, user access levels, passwords and encryption
9	<ul style="list-style-type: none"> <input type="checkbox"/> I can fully demonstrate every standard shown above

G: General

SA: Systems architecture

M: Memory

ST: Storage WAWN: Wired and wireless networks

NTPL: Network Topologies Protocols and Layers

SSy: System security

SSw: Systems software

ELCEC: Ethical, legal, cultural and environmental concerns

Computing 2: Computational thinking, algorithms and programming

U1	<ul style="list-style-type: none"> <input type="checkbox"/> PT: I can state what a variable is <input type="checkbox"/> PT: I can make a list of instructions <input type="checkbox"/> CL: I know what binary is <input type="checkbox"/> TFL: I can use an IDE (integrated development environment) <input type="checkbox"/> DR: I can explain what data is
U2	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can state what an algorithm is <input type="checkbox"/> PT: I can fix a problem in a program <input type="checkbox"/> CL: I can count up to 15 in binary <input type="checkbox"/> PRB: I tested a basic program <input type="checkbox"/> DR: I can give examples of different types of data
U3	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can state what both pseudocode and flowcharts are, and how they can be used to help design algorithms <input type="checkbox"/> PT: I can state what constants, operators, inputs, outputs and assignments are <input type="checkbox"/> PT: I can explain why algorithms are necessary <input type="checkbox"/> DR: I can explain how a string is different for a number <input type="checkbox"/> DR: I can remember some of the names given to units of data
1	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can remember three elements of computational thinking; abstraction, decomposition, algorithmic thinking <input type="checkbox"/> PT: I can plan the data types of my data <input type="checkbox"/> PT: I can demonstrate the use common arithmetic operators <input type="checkbox"/> PRP: I can make maintainable programs, with comments and indentation <input type="checkbox"/> CL: I know why data is represented in computer systems in binary form <input type="checkbox"/> TFL: I know what an IDE (integrated development environment) is and can give examples <input type="checkbox"/> DR: I can remember most of the units of data including; bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, and petabyte <input type="checkbox"/> DR: I know what the term 'Character – Set' means <input type="checkbox"/> DR: I understand how a black and white image can be represented as binary <input type="checkbox"/> DR: I know how sound can be sampled and stored in digital form
2	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can outline what standard search algorithms are; and how the binary and linear searches work <input type="checkbox"/> A: I can interpret, correct or complete algorithms <input type="checkbox"/> PT: I can define the three basic programming constructs; sequence, selection and iteration <input type="checkbox"/> PT: I can use data types including; integer, real, Boolean, characters and strings <input type="checkbox"/> PRP: I can describe the purpose of testing <input type="checkbox"/> CL: I can identify the symbols used to create simple logic diagrams for AND, OR and NOT <input type="checkbox"/> CL: I can apply computer related mathematics including; + - / * <input type="checkbox"/> TFL: I know the purpose of translators <input type="checkbox"/> TFL: I can demonstrate the use of common tools and facilities available to and IDE including; editors, error diagnostics, run-time environment, translators <input type="checkbox"/> DR: I can remember the units of data in order, including; bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, and petabyte <input type="checkbox"/> DR: I can use binary codes to represent characters <input type="checkbox"/> DR: I can describe the relationship between the number of bits per character and the number of characters which can be represented (ASCII, extended ASCII and Unicode) <input type="checkbox"/> DR: I know how an image is represented as a series of pixels in binary, and how metadata is included in the file <input type="checkbox"/> DR: I know what compression is and why it is needed <input type="checkbox"/> DR: I can explain the types of compression; lossy and lossless with examples

KEY:

3	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can outline what standard sorting algorithms are; with particular reference to bubble, merge and insertion sorting algorithms <input type="checkbox"/> PT: I can plan what variables, constants, operators, inputs, outputs and assignment I will need in my algorithms <input type="checkbox"/> PT: I can make use sequential programming constructs to control the flow of a program <input type="checkbox"/> PT: I can demonstrate the use common Boolean operators <input type="checkbox"/> PRP: I can select and use suitable test data <input type="checkbox"/> PRP: I know how to identify syntax and logic errors <input type="checkbox"/> CL: I can draw simple logic diagrams using the operations AND, OR and NOT <input type="checkbox"/> CL: I can apply computer related mathematics including; Exponentiation (\wedge), MOD and DIV <input type="checkbox"/> TFL: I can describe the characteristics and purpose of different levels of programming language, including low-level languages <input type="checkbox"/> TFL: I can describe the characteristics of an assembler, a compiler and an interpreter <input type="checkbox"/> DR: I can explain how the colour depth and resolution has on the size of a file <input type="checkbox"/> DR: I know how sampling intervals and other factors affect the size of a sound file and the quality of its playback; sample size, bit rate, sampling frequency
4	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can explain what computational thinking means, and the three elements that are considered part of this; abstraction, decomposition, algorithmic thinking <input type="checkbox"/> PT: I can demonstrate the use of variables, constants, operators, inputs, outputs and assignment I will need in my algorithms <input type="checkbox"/> PT: I can make use of selection programming constructs to control the flow of a program <input type="checkbox"/> PT: I can use records to store data <input type="checkbox"/> PRP: I can demonstrate the use of different types of testing, including; iterative and final/terminal <input type="checkbox"/> CL: I can create truth tables for AND, OR and NOT <input type="checkbox"/> DR: I can explain how data needs to be converted into a binary format to be processed by a computer
5	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can explain how standard search algorithms work and trace through with examples; in particular how the binary and linear searches work <input type="checkbox"/> I can break down a problem into its basic components, which will become my functions or procedures <input type="checkbox"/> A: I know how to produce algorithms using; pseudocode and flow diagrams <input type="checkbox"/> PT: I can make use of iterative programming constructs to control the flow of a program <input type="checkbox"/> PT: I can demonstrate the use casting <input type="checkbox"/> CL: I can combine Boolean operators using AND, OR and NOT to two levels
6	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can explain how standard sorting algorithms work and trace through with examples; in particular how the bubble, merge and linear sorting algorithms work. <input type="checkbox"/> PT: I can use basic string manipulation <input type="checkbox"/> PT: I can use SQL to search for data <input type="checkbox"/> PT: I can create efficient algorithms <input type="checkbox"/> PRP: I can explain defensive design considerations, including; input sanitisation and validation, planning for contingencies, anticipating misuse and authentication <input type="checkbox"/> CL: I can apply logical operators in appropriate truth tables to solve problems
7	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can create standard search algorithms, including and binary and linear searching algorithms <input type="checkbox"/> PT: I can use basic file handling operations, including; open, read, write and close <input type="checkbox"/> PT: I can use one dimensional arrays (or equivalent) when solving problems <input type="checkbox"/> PT: I can use sub programs (functions and procedures) to produce a structured program <input type="checkbox"/> PT: I can test my algorithms to ensure they are robust
8	<ul style="list-style-type: none"> <input type="checkbox"/> A: I can create standard sorting algorithms, including bubble, merge and sorting algorithms <input type="checkbox"/> PT: I can use two dimensional arrays (or equivalent) when solving problems <input type="checkbox"/> PT: I can evaluate the effectiveness of my algorithms and suggest improvements
9	<ul style="list-style-type: none"> <input type="checkbox"/> I can fully demonstrate every standard shown above

A: Algorithms PT: Programming techniques PRP: Producing robust programs

CL: Computational logic TFL: Translators and facilities of languages DR: Data representation

Computing 3: Programming project

U1	<input type="checkbox"/> PT: I can state what a variable is <input type="checkbox"/> PT: I can make a list of instructions <input type="checkbox"/> D: I can make a basic outline of the problem
U2	<input type="checkbox"/> PT: I can fix a problem in a program <input type="checkbox"/> PT: I can state what an algorithm is <input type="checkbox"/> D: I can plan what the solution may require, but this may be incomplete
U3	<input type="checkbox"/> PT: I can state what constants, operators, inputs, outputs and assignments are <input type="checkbox"/> PT: I can explain why algorithms are necessary <input type="checkbox"/> PT: I can trace through a flowchart using test data to find a result <input type="checkbox"/> PT: I can trace through pseudocode using test data to find a result <input type="checkbox"/> D: I can plan what the solution may require, and this will be mostly complete
1	<input type="checkbox"/> PT: I can plan the data types of my data <input type="checkbox"/> PT: I can demonstrate the use common arithmetic operators <input type="checkbox"/> PT: I can plan what data I need from a user (input) <input type="checkbox"/> PT: I can plan what data I need to show to the user (output) <input type="checkbox"/> D: I can identify nearly all of the requirements for a solution to a problem, using computational thinking techniques <input type="checkbox"/> T: I can produce a report that outlines the main points of my investigation
2	<input type="checkbox"/> PT: I can plan what type of data I need to assign to my variables <input type="checkbox"/> PT: I can define the three basic programming constructs; sequence, selection and iteration <input type="checkbox"/> PT: I can use data types including; integer, real, Boolean, characters and strings appropriately in solutions to problems <input type="checkbox"/> A: I know how to analyse and identify the requirements for a solution to a problem <input type="checkbox"/> D: I can identify success criteria for a system <input type="checkbox"/> T: I can produce a report covering some of the aspects of investigation <input type="checkbox"/> T: I can test my own solution
3	<input type="checkbox"/> PT: I can plan what variables, constants, operators, inputs, outputs and assignment I will need in my algorithms <input type="checkbox"/> PT: I can make use sequential programming constructs to control the flow of a program <input type="checkbox"/> PT: I can demonstrate the use common Boolean operators <input type="checkbox"/> D: I can design suitable algorithms to represent the solution to a problem <input type="checkbox"/> A: I can identify suitable data requirements for their system <input type="checkbox"/> D: I can use appropriate data types in a system <input type="checkbox"/> Dev: I can develop a solution to the identified problem using a suitable programming language(s) <input type="checkbox"/> T: I can produce a report covering most of the aspects of the investigation <input type="checkbox"/> T: I know how to present my information in a clear form which is understandable by a 3rd party which is easily navigable <input type="checkbox"/> T: I can use specialist terms correctly most of the time
4	<input type="checkbox"/> PT: I can demonstrate the use of variables, constants, operators, inputs, outputs and assignment I will need in my algorithms <input type="checkbox"/> PT: I can make use of selection programming constructs to control the flow of a program <input type="checkbox"/> PT: I can use records to store data <input type="checkbox"/> A: I can set clear objectives that show an awareness of the need for real world utility <input type="checkbox"/> A: I can use abstraction and decomposition to design the solution to a problem <input type="checkbox"/> D: I can identify suitable variables and structures with appropriate validation for a system <input type="checkbox"/> Dev: I can explain the solution using suitable annotation and evidence of development <input type="checkbox"/> Dev: I can use the terminology correctly in my write up <input type="checkbox"/> T: I can produce a full report covering all aspects of the investigation <input type="checkbox"/> T: I can present my evaluation in a relevant, clear, organised, structured and coherent format <input type="checkbox"/> T: I can present a conclusion to the report

5	<input type="checkbox"/> PT: I can make use of iterative programming constructs to control the flow of a program <input type="checkbox"/> PT: I can understand and use suitable loops including count and condition controlled loops <input type="checkbox"/> PT: I can demonstrate the use casting <input type="checkbox"/> A: I can use validation to ensure a robust solution to a problem <input type="checkbox"/> D: I can design suitable input and output formats and navigation methods for a system <input type="checkbox"/> D: I can select suitable techniques for the development of a solution <input type="checkbox"/> Dev: I can demonstrate the testing and refinement of the code <u>during development</u> <input type="checkbox"/> Dev: I can show an understanding of the relevant information by presenting evidence of the development of my solutions <input type="checkbox"/> T: I know how to critically appraise the evidence that I have presented <input type="checkbox"/> T: I can use specialist terms correctly and appropriately
6	<input type="checkbox"/> PT: I can use basic string manipulation <input type="checkbox"/> PT: I can use SQL to search for data <input type="checkbox"/> PT: I can create efficient algorithms <input type="checkbox"/> A: I can identify test procedures to be used during and after development to check the system against the success criteria of a system <input type="checkbox"/> Dev: I can use suitable techniques to solve <u>all</u> aspects of the problem <input type="checkbox"/> Dev: I can show an understanding of the technical terminology/concepts that arise from my investigation through my analysis of the data collected <input type="checkbox"/> T: I can attempt to justify my conclusions but they may be incomplete
7	<input type="checkbox"/> PT: I can use basic file handling operations, including; open, read, write and close <input type="checkbox"/> PT: I can use one dimensional arrays (or equivalent) when solving problems <input type="checkbox"/> PT: I can use sub programs (functions and procedures) to produce a structured program <input type="checkbox"/> PT: I can test my algorithms to ensure they are robust <input type="checkbox"/> D: I can design and use functions/sub programs to produce structured reusable code <input type="checkbox"/> Dev: I can deploy practical techniques in an efficient and logical manner <input type="checkbox"/> T: I can justify my conclusions based on the evidence provided
8	<input type="checkbox"/> PT: I can use two dimensional arrays (or equivalent) when solving problems <input type="checkbox"/> PT: I can evaluate the effectiveness of my algorithms and suggest improvements <input type="checkbox"/> D: I can fully design and produce a complete test plan using suitable techniques <input type="checkbox"/> Dev: I can use the terminology correctly and the concepts surrounding my topic and contained in the information collected correctly when it comes to producing analysis in the supporting script <input type="checkbox"/> T: I can present fully justified conclusion that corresponds directly with the evidence I produced
9	<input type="checkbox"/> I can fully demonstrate every standard shown above

KEY:

PT: Programming Techniques

A: Analysis

D: Design

Dev: Development

T: Testing, evaluation and conclusions