Computer Science Long Term Curriculum Map for Pupils in Key Stage 1,2 or 3

The knowledge and skills described in the National Curriculum have been mapped out across year groups and then divided into the academic year. A pupil working through the plan below from Autumn 1 in year 1 to Summer 2 in year 9 would have covered all aspects of the National Curriculum in a sequential, logical way. The curriculum covers Education for A Connected World guidance which is a framework to equip children and young people for digital life. Teachers take this map and then use it to devise a sequence of learning activities over the half term. Teachers start by considering the starting points of each of the pupils in their class group. Given that we are teaching pupils with SEND or with an often-challenging educational history there will be pupils who are chronologically older but are still working at the level of a much younger pupil. Our teachers ensure that they plan lessons which will build on strong foundations then move forward through the map ensuring the learning is embedded in the memory of the individual pupils for example, some of our pupils may be chronologically year 7 but are working through the map at year 3. They may also be working at year 3 in one aspect but at year 5 in another

Computer Science Long Term Curriculum Map

1	**Autumn 1** computing Systems and Networks - Technology around us	**Autumn 2** Creating Media - Digital Painting	**Spring 1** Programming A - Moving a robot	**Spring 2** Data and Information - Grouping Data Creating Media - Digital	**Summer 1** Creating Media - Digital Writing	Summer 2 programming B - Programming Animations
1	I can identify technology I can identify a computer and its main parts I can use a mouse in different ways I can use a keyboard to type on a computer I can use the keyboard to edit text. I can create rules for using technology responsibly.	I can describe what different freehand tools do I can use the shape tool and the line tools I can make careful choices when painting a digital picture I can explain why I chose the tools I used I can use a computer on my own to paint a picture I can compare painting a picture on a computer and on paper	I can explain what a given command will do I can act out a given word I can combine forward and backward commands to make a sequence I can plan a simple program I can find more than one solution to a problem	I can label objects I can identify the objects can be counted I can describe objects in different ways I can count objects with the same properties I can compare groups of objects I can answer questions about groups of objects	I can use a computer to write I can add and remove texts on a computer I can identify that the look of texts can be changed on a computer I can make careful choices whilst changing texts I can explain why I used the tools that I chose I can compare typing on a computer to writing on paper	I can choose a command for a given purpose I can show that a series of commands can be joined together I can identify the effect of changing a value I can explain that each sprite has its own instructions I can design the parts of a project I can use my algorithm to create a programme
2	Computer systems and networks – IT	Creating media – digital photography	Programming A – Robot algorithms	Data information – pictograms	Creating media – making music	Programming B – An introduction to quizzes

2	I can recognise the uses and features of information technology I can identify the uses of information technology in the school I can identify information technology beyond school I can explain how information technology helps us I can explain how to use information technology safely I can recognise that choices are made when using information technology	I can use a digital device to take a photograph I can make choices when taking a photograph I can describe what makes a good photograph I can decide how photographs can be improved I can use tools to change an image I can recognise that photos can be changed	I can describe a series of instructions as a sequence I can explain what happens when we change the order of instructions I can use logical reasoning to predict the outcome of a program (series of commands) I can explain that program projects can have code and artwork I can design an algorithm I can create and debug a program that I have written	I can recognise that we can count and compare objects using tally charts I can recognise that objects can be represented as pictures I can create a pictogram I can select objects by attribute and make comparisons I can recognise that people can be described by attributes I can explain that we can present information using a computer	I can say how music can make us feel I can identify that there are patterns in music I can show how music is made from a series of notes I can create music for a purpose I can explain how I can make my learning better	I can explain that a sequence of commands has a start I can explain that a sequence of commands has an outcome I can create a program using a given design I can change a given design I can create a program using my own design I can decide how my project can be improved
3	Computer systems and networks – Connecting computers	Creating media – Stop frame animation	Programming A – Sequence in music	Data information – Branching databases	Creating media – desktop publishing	Programming B – Events and actions

3	I can explain how digital devices function I can identify input and output devices I can recognise how digital devices can change the way we work I can explain how a computer network can be used to share information I can explore how digital devices can be connected I can recognise the physical components of a computer	I can explain that animation is a sequence of drawings or photographs I can relate animated movement with a sequence of images I can plan an animation I can identify the need to work consistently and carefully I can review and improve an animation I can evaluate the impact of adding other media to an animation	I can explore a new programming environment I can identify that commands have an outcome I can explain that a program has a start I can recognise that a sequence of commands can have an order I can change the appearance of my project I can create a project from a task description	I can create questions with yes or no answers I can identify the object attributes needed to collect relevant data I can create a branching database I can explain why it is helpful for a database to be well structured I can identify objects using a branching database I can compare the information shown in a pictogram with a branching database	I can recognise how texts and images convey information I can recognise that text and layout can be edited I can choose appropriate page settings I can add content to a desktop publishing publication I can consider how different layouts can suit different purposes I can consider the benefits of desktop publishing	I can explain how a sprite moves in an existing project I can create a program to move a sprite in four directions I can adapt a program to a new context I can develop my program by adding features I can identify and fix bugs in a program I can design and create a maze-based challenge
4	Computer systems and networks – the internet	Creating media – photo editing	Programming A – repetition and shapes	Data information – data logging	Creating media – audio editing	Programming B – repetition in games

4	I can describe how networks and physically connect to other networks I can recognise how network devices make up the internet I can outline how websites can be shared via the worldwide web (www) I can describe how content can be added and accessed on the www I can recognise how the content of www is created by people I can evaluate the consequences of unreliable content	I can explain that digital images can be changed I can change the composition of an image I can describe how images can be changed for different uses I can make good choices when selecting different tools I can recognise that not all images are real I can evaluate how changes can improve an image	I can identify that accuracy in programming is important I can create a program in text-based language I can explain what repeat means I can modify a count-controlled loop to produce a given outcome I can decompose a task into small steps I can create a program that uses count-controlled loops to produce a given outcome	I can explain that data gathered over time can be used to answer questions I can use a digital device to collect data automatically I can explain that a datalogger collects datapoints from sensors over time I can use data collected over a long duration to find information I can identify the data needed to answer questions	I can identify that sound can be digitally recorded I can use a digital device to record sound I can explain that a digital recording is stored as a file I can explain that audio can be changed through editing I can show that different types of audio can be combined and played together I can evaluate editing choices made	I can develop the use of controlled loops in a different programming environment I can explain that in programming there are infinite loops and count-controlled loops I can develop a design that includes two or more loops which run at the same time I can modify an infinite loop in a given program I can design a project that includes repetition I can create a program that includes repetition
5	Computer systems and networks – Sharing information	Creating media – video editing	Programming A – selection in physical computing	Data information – flat file databases	Creating media – vector drawing	Programming B – Selection in quizzes

5	I can explain that computers can be connected together to form systems I can recognise the role of computer systems in our lives I can recognise how information is transferred over the internet I can explain how sharing information online lets people in different places work together I can contribute to a shared project online I can evaluate different ways of working together online	I can explain what makes a video effective I can identify digital devices that can record video I can capture video using a range of techniques I can create a storyboard I can identify that video can be improved through reshooting and editing I can consider the impact of the choices made when making and sharing a video	I can control a simple circuit connected to a computer I can write a program that includes count-controlled loops I can explain that a loop can stop when a condition is met I can explain that a loop can be used to repeatedly check whether a condition has been met I can design a physical project that includes selection I can create a program that controls a physical computing project	I can use a form to record information I can compare paper and computer- based databases I can outline how grouping and then sorting data allows us to answer questions I can explain that tools can be used to select specific data I can explain that computer programs can be used to compare data visually I can apply my knowledge of a database to ask and answer real-word questions	I can identify that drawing tools can be used to produce different outcomes I can create a vector drawing by combining shapes I can use tools to achieve a desired effect I can recognise that vector drawings consist of layers I can group objects to make them easier to work with I can evaluate my vector drawing	I can explain how selection is used in computer programs I can relate that a conditional statement connects a condition to an outcome I can explain how selection directs the flow of a program I can design a program that uses selection I can create a program which uses selection I can evaluate my program
6	Computer systems and networks – Communication	Creating media – Web page creation	Programming A – Variables in games	Data information – Introduction to spreadsheets	Creating media – 3D modelling	Programming B – Sensing
6	I can identify how to use a search engine I can describe how search engines select results I can explain how search results are ranked I can recognise why the order of results is important and to whom I can recognise how we communicate using technology I can evaluate different methods from online communication	I can review an existing website and consider its structure I can plan the features of a webpage I can consider the ownership and use of images (copyright) I can recognise the need to preview pages I can outline the need for a navigation path I can recognise the implications of linking to content owned by other people	I can define a 'variable' as something that is changeable I can explain why a variable is used in a program I can choose how to improve a game by using variables I can design a project that builds on a given example I can use my design to create a project I can evaluate my project	I can identify questions which can be answered using data I can explain that objects can be described using data I can explain that formulas can be used to produce calculated data I can apply formulas to data, including duplicating I can create a spreadsheet to plan an event I can choose suitable ways to present data	I can use a computer to create and manipulate three-dimensional digital objects (3D) I can compare working digitally with 2D and 3D graphics I can construct a digital 3D model of a physical object I can identify that physical objects can be broken down into a collection of 3D shapes I can design a digital model by combing 3D objects I can develop and improve a 3D model	I can create a program to run on a controllable device I can explain that selection can control the flow of a program I can update a variable with a user input I can use a conditional statement to compare a variable to a value I can design a project that uses inputs and outputs on a controllable device I can develop a program to use inputs and outputs on a controllable device

7	Computer systems and networks – Semaphores to the internet	Using media – Gaining support for a cause	Impact of Technology – Collaborating online respectfully	Modelling data - Spreadsheets	Programming 1 - Scratch	Programming 2 - Scratch

7	I can define what a computer network is and explain how data is transmitted between computers across networks I can define 'protocol' and provide examples of non-networking protocols I can list examples of the hardware necessary for connecting devices to networks I can compare wired to wireless connections and list examples of specific technologies currently used to implement such connections I can define bandwidth using the appropriate units for measuring the rate at which data is transmitted and discuss with familiar examples where bandwidth is important I can define what the internet is I can explain how data travels between computers across the internet I can describe keywords such as; protocols, packets and addressing I can explain the difference between the internet, its services and the www	I can select the most appropriate software to use to complete a task I can identify the key features of a word processor and apply these features to format a document I can evaluate formatting techniques to understand why we format documents I can select appropriate images for a given context I can apply appropriate formatting techniques I can demonstrate an understanding of licensing issues involving online content by applying appropriate creative commons license I can demonstrate the ability to credit the original source of an image I can critique digital content for credibility I can apply techniques in order to identify whether, or not, the source is credible I can apply referencing techniques and understand the concept of plagiarism I can evaluate online sources for use in own work	I can create a memorable and secure password for an account on the school network I can remember the rules of computer use I can find personal documents and common applications I can recognise a respectful email I can construct an effective email and send it to the correct recipient I can describe how to communicate with peers online I can plan effective presentations for a given audience I can describe cyber bullying I can explain the effects of cyber bullying I can check who I'm talking to online	I can identify columns, rows, cells and cell-references in spreadsheet software I can use formatting techniques in a spreadsheet I can use basic formulas with cell references to perform calculations in a spreadsheet (+ - * /) I can use the auto-fill tool to replicate cell data I can explain the difference between data and information I can explain the differences between primary and secondary sources of data I can collect and analyse data I can create appropriate charts in a spreadsheet I can use the functions SUM, COUNTA, MAX and MIN in a spreadsheet I can use a spreadsheet to sort and filter data I can use the functions AVERAGE, COUNTIF and IF in a spreadsheet I can use conditional formatting I can apply all the skills from this unit into my learning	I can compare how humans and computers understand instructions I can define a sequence as instructions performed in order with each executed in turn I can predict the outcome of a simple sequence I can modify a sequence I can define a variable as a name that refers to data being stored by a computer I can recognise that computers follow the control flow of input/process/output I can predict the outcome of a simple sequence that includes variables I can trace the variables within a sequence I can make a sequence that includes a variable I can define a condition as an expression that will be evaluated as either true or false I can identify that selection uses conditions to control the flow of a sequence I can identify where selection statements can be used in a program I can modify a program to include selection I can create conditions that use comparison operators (< > =) I can create conditions that use logic operators (and / or / not)	I can define a subroutine as a group of instructions that will run when called by a main program or other subroutines I can define decomposition as breaking a problem down into smaller, more manageable sub problems I can identify how subroutines can be used for decomposition I can identify where condition-controlled iteration can be used in a program I can implement condition-controlled iteration in a program I can evaluate which type of iteration is required in a program I can define a list as a collection of related elements that are referred to by a single name I can describe the need for lists I can identify when lists need to be used in a program I can use a list I can apply appropriate constructs to solve a problem

	I can describe how services are provided over the internet and list some of these in the way that they are used I can explain the term connectivity as the capacity for connected devices (internet of things) to collect and share information about me or without my knowledge (including microphones, cameras and geolocation) I can describe how internet devices can affect me I can describe components (servers, browsers, pages, HTTP and HTTPS protocols, etc.) and how they work together.	I can construct a blog using appropriate software I can organise the content of the blog based credible sources I can apply referencing techniques that credit authors appropriately I can design the layout of the content to make it suitable for the audience			I can identify where selection statements can be used in a program that include comparison and logical operators I can define iteration as a group of instructions that are repeatedly executed I can describe the need for iteration I can identify where count controlled iteration can b used in a program I can implement count-controlled iteration in a program I can detect and correct errors in a program (debugging) I can independently design and apply programming constructs to solve a problem (SUBROUTINE selection, count-controlled iteration, operators and variables)	
8	Developing for the web	Representations from clay to silicone	Mobile app development	Media – Design vector graphics	Computer systems	Introduction to python programming

	I can describe what HTML is I can use HTML to structure static web pages I can modify HTML tags using inline styling to improve the appearance of web pages I can display images within a web page I can apply HTML tags to construct a web page structure from a provided design I can describe what CSS is I can address the benefits of using CSS to style pages instead of inline formatting I can describe what a search engine is I can describe how search engines 'crawl' through the World Wide Web and how they select and rank results I can analyse how search engines select and rank results when searches are made I can use search technologies effectively I can discuss the impact of search technologies and the issues that arise by the way they function and the way they are used I can create hyperlinks to allow users to	I can list examples of representation I can recall that representations are used to store, communicate and process information I can provide examples of how different representations are appropriate for different tasks I can recall that characters can be represented as sequences of symbols and list examples of character coding schemes I can provide examples of how symbols are carried on physical media I can explain what binary digits (BITS) are in terms of familiar symbols, such as digits and letters I can measure the size of length of a sequence of bits as the number of binary digits that it contains I can describe how natural numbers are represented as sequences of binary digits I can convert a decimal number to binary and vice versa I can convert between units and multiples of representation size	I can Identify when a problem needs to be broken down I can implement and customise GUI elements to meet the needs of the user TRUE I can recognise that events can control the flow of a program I can use a user input in an event-driven programming environment I can use variables in an event-driven programming environment I can develop a partially complete application to include additional functionality I can identify and fix common coding errors I can pass the value of a variable into an object I can establish user needs when completing a creative project I can apply decomposition to break down a large problem into more manageable steps I can use user input in a block-based programming language I can use a block-based programming language to create a sequence I can use variables in a block-based programming language	I can draw basic shapes with different properties (fill and stroke, shape specific attributes) I can manipulate individual objects (select, move, resize, rotate, duplicate, flip, z-order) I can manipulate groups of objects (select group/ungroup, align and distribute) I can combine paths by applying operations (union, difference, intersection) I can convert objects to paths I can draw paths I can edit path nodes I can combine multiple tools and techniques to create a vector graphic design I can explain what vector graphics are I can provide examples where using vector graphics would be appropriate I can peer assess another peer's project work I can improve my own project work based on feedback I can complete a summative assessment	I can recall that a general-purpose computer system is a device for executing programs I can recall that a program is a sequence of instructions that specify operations that are to be performed on data I can explain the difference between a general purpose, a computing system and a purpose-built device I can describe the function of the hardware components used in computing systems I can describe how the hardware component used in computing systems work together in order to execute programs I can recall that all computing systems work together to execute programs I can define what an operating system is and recall its role in controlling program execution I can describe NOT AND and OR logical operators and how they are used to form logical expressions I can use logic gates to construct logic circuits and associate these with logical operators and expressions I can describe how hardware is built out of increasingly complex logic circuits I can recall that since hardware is built out of logic circuits, data and instructions	I can describe what algorithms and programs are and how they differ Recall that a program written in a programming language needs to be translated to be executed by a machine I can write simple Python programs that display messages, assign values to variables, and receive keyboard input I can locate and correct common syntax errors I can describe the semantics of assignment statements I can use simple arithmetic expressions in assignment statements to calculate values I can receive input from the keyboard and convert it to a numerical value I can use relational operators to form logical expressions I can use binary selection (if, else statements) to control the flow of program execution I can generate and use random integers Use multi-branch selection (if, Elif, else statements) to control the flow of program execution I can describe how iteration (while statements) controls the flow of program execution I can use iteration (while loops) to control the flow of program execution I can use variables as counters in iterative programs

	navigate between multiple web pages I can implement navigation to complete a functioning website I can complete summative assessment	I can provide examples of the different ways that binary digits are physically represented in digital devices I can apply all the sills covered in this unit	I can reflect and react to user feedback I can use a block-based programming language to include sequencing and selection I can evaluate the success of the programming project		alike need to be represented using binary digits I can provide broad definitions of artificial intelligence and machine learning I can describe the steps involved in training machines to perform tasks (gathering data, training and testing) I can describe how machine learning differs from traditional programming I can associate the use of AI with moral dilemmas I can explain the implications of sharing program code I can	I can combine iteration and selection to control the flow of program execution I can use Boolean variables as flags
9	Data Science	Media Animations	Representations- going audiovisual	Physical computing	Cybersecurity	Python Programming with sequences of Data

9	I can define data science I can explain how visualising data can help identify patterns and trends to help us gain insights I can use an appropriate software tool to visualise data sets and look for patterns or trends I can recognise examples of where large data sets are used in daily life I can select criteria and use data set to investigate predictions I can evaluate findings to support arguments for or against a prediction I can define the terms 'correlation' and 'outliers' in relation to data trends I can identify the steps of the investigative cycle I can solve a problem by implementing steps of the investigative cycle on a data set I can use findings to support a recommendation I can identify the steps of the investigative cycle Ican identify the data needed to answer a question defined by the learner I can create a data capture form	I can add, delete, and move objects I can scale and rotate objects I can use a material to add colour to objects I can add, move, and delete keyframes to make basic animations I can play, pause, and move through the animation using the timeline I can create useful names for objects I can join multiple objects together using parenting I can use edit mode and extrude I can use loop cut and face editing I can apply different colours to different parts of the same model I can use proportional editing I can use the knife tool Use subdivision I can add and edit set lighting I can set up the camera I can compare different render modes I can create a 3–10 second animation I can render out the animation	I can describe how digital images are composed of individual elements I can recall that the colour of each picture element is represented using a sequence of binary digits I can define key terms such as; pixels, resolution and colour depth I can describe how an image can be represented as a sequence of bits I can describe how colour can be represented as a mixture of green, red and blue with a sequence of bits representing each colours intensity I can compute the representation size of a digital image by multiplying resolution (number of pixels) with colour, depth (number of bits used to represent the colour of individual pixels) I can describe the trade-off between representation, size and perceived quality of digital images I can perform basic images editing tasks using appropriate software and combine them in order to solve more complex problems requiring image manipulation I can explain how the manipulation of digital images amounts to	I can describe what the micro:bit is I can list the micro:bit's input and output devices I can use a development environment to write, execute, and debug a Python program for the micro:bit I can write programs that use the micro:bit's built-in input and output devices I can write programs that use GPIO pins to generate output and receive input I can write programs that communicate with other devices by sending and receiving messages wirelessly I can design a physical computing artefact purposefully keeping in mind; the problem at hand, the needs of the audience involve and the available resources I can decompose the functionality of a physical computing system into simpler features I can implement a physical computing project while following, revising and refining the project plan	I can explain the difference between data and information I can critique online services in relation to data privacy I can identify what happens to data entered online I can explain the need for the data protection act I can recognise how human errors pose security risks to data I can implement strategies to minimise the risk of data being compromised through human error I can define hacking in the context of cyber security I can explain how a DDOS attack can impact users of online services I can identify strategies to reduce the chance of a bruit force attack being successful I can explain the need for the computer misuse act I can list the common malware threats I can examine how different types of malware causes problems for computer systems I can question how malicious bots can have an impact on societal issues I can compare security threats against probability and the potential impact on organisations I can explain how networks can be protected from common security threats	I can write programs that display messages, receive keyboard input and use simple arithmetic expressions in assignment statements I can locate and correct common syntax errors I can create lists and access individual items I can use selection (**if-elif-else* statements) to control the flow of program execution I can perform common operations on lists or Indvidual items I can use iteration (whilst statements) to control the flow of program execution I can use iteration (for loops) to iterate over lists and strings I can use variables to keep track of counts and sums I can combine key programming language features to develop solutions to meaningful problems I can apply all of the skills covered in this unit

	I can describe the need for data cleansing I can apply data cleansing techniques to a data set I can visualise a data set I can analyse visualisations to identify patterns, trends, and outliers I can draw conclusions and report finding		arithmetic operations on their digital representation I can describe and assess the creative benefits and ethical drawbacks of digital manipulation (education for a connected world) I can recall that sound is a wave I can explain the function of microphones and speakers as components that capture and generate sound I can define key terms such as; sample, sampling, frequency/rate, sample size I can describe how sounds are represented as a sequence of bits I can calculate representation size for a given digital size given its attributes I can explain how attributes such as sampling frequency and sample size affect characteristics such as representation, size and perceived quality and the trade-offs involved I can perform basic sound editing tasks using appropriate software and combine them in order to solve more complex problems requiring sound manipulation		I can identify the most effective methods to prevent cyber attacks	

			I can recall that bitmap images and postcode sound are not the only binary representations of images and sounds I can define compression and describe why it is necessary			