St Cecilia's R. C. High School

Key Stage 1 and 2

Aims of Study

https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study/national-curriculum-in-england-computing-programmes-of-study#key-stage-2

Key Substantive Knowledge Carried Forward (subject knowledge)

Pupil experience at KS2 is very varied. Most pupils bring little or no substantive knowledge with them. For example, some pupils have used Scratch but no key concepts such as *sequence* or *iteration* have been introduced.

Many pupils have the idea of being safe online but not what this means in practice.

Key Disciplinary Knowledge Carried Forward (methods/framework to establish knowledge)

At KS2 pupils' disciplinary knowledge appears to be based on using touch screen devices and the current Year 7 have little experience of using a mouse or keyboard. Computational thinking experience is lacking and a large number of pupils have not made links between how different applications work (e.g. File, Save is always in the same place)
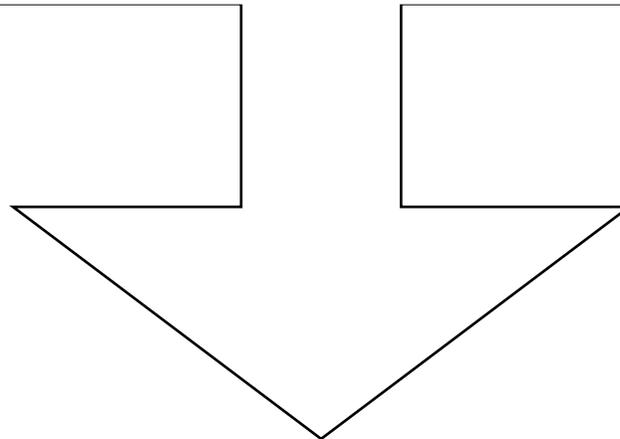
Year 7

Unit Title	Welcome Unit	Online Safety	Computational Thinking	Using Documents	Flow Charts
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Know the expectations of the department in terms of behaviour and health and safety. Know how to log into the school network. Know how to access Edulink in school and at home. Know how to access office 365 in school and at home. Set up folders for their subjects and understand how to save into these folders.	Pupils will look at how to act SMART when online and how to stay safe when using chatrooms and social media. Pupils will look at netiquette and how they should behave when online.	Pupils will look at what computational thinking is and where it can be used. Pupils will look at what the different stages of computational thinking are (decomposition, abstraction, pattern recognition and algorithms) and be able to use them to solve a range of different tasks.	Pupils will at how to search for information effectively and efficiently and use the information they have gathered to produce documents in different programs for different audiences. Pupils will look at developing their digital literacy skills.	Pupils will be looking at how flow charts are used to model how data flows through a computer system. Pupils will then be using the program Flowol to model data flowing through everyday situations such as traffic lights, coffee machines, pedestrian crossings etc.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	You should never tell someone else your password so they are not able to access the network as you. A strong password should be 8-12 characters long and use a mix of letters, numbers and special characters. Passwords should not be the same for all accounts you have and should not be linked to hobbies and interest you have. It is important to save files with names that are clear, not too long and are about	S stands for keeping personal information safe. M stands for meet ups and making sure that a trusted adult goes with you if you meet someone online. A stands for accepting and making sure that you only accept requests and messages from people that you do actually know in person and not just online. R stands for reliable and understanding that not everything you see and read is always reliable and true when online. T stands for tell and how important it is to tell a	Computational thinking is about you can solve problems by breaking the problems down and looking for patterns and coming up with a solution that is clear and simple to follow. Computational thinking applies in school for all subjects but also can help with issues outside of school. Decomposition means to break a problem down into smaller bits so that it helps you see a possible solution. Abstraction means to remove any unnecessary detail that is not needed	A search engine is a program that are designed to search the internet and look through billions of webpages, looking for information that matches what you are searching for. Boolean expressions are ways of making your search more specific. AND, OR, NOT are examples of Boolean expressions. The purpose of a document is an important factor in the design of the document.	A flow chart shows the way data will flow through a program. A flow chart is made up of symbols. A rhombus shows the input or output going into the program. A rectangle shows where processes take place such as creating a variable or a delay. A diamond shows where decisions will be made in the program . This is selection and will have a YES/NO or TRUE/FALSE option. The arrows show the direction the data will flow through the program.

	the document you have made. The root folder is the main folder and should have a clear name that describes the contents of the folder.	trusted adult if you feel something is wrong when online. Also to tell a trusted adult about what you are doing online and involve them in your online life. Netiquette are rules that help you to behave responsibly online and respectfully.	in the solution of the problem.		
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Be able to log into the network in the next lesson without any help. Be able to log into Edulink and office 365 at home.	Produce a poster about SMART rules. Reading task based on Netiquette rules.	Analyse a problem Pick out the most important information Work out how to solve the problem	Researching information for the documents they are producing. Planning their work to show how they have shown the audience and purpose of the document.	Breaking down a problem into steps and then putting these steps into flow chart symbols. Using a mimic to plan a solution for an everyday computer system such as traffic lights or a coffee machine.
Examples of Reading Opportunity	Being able to follow instructions for how to log in and which programs to open by reading the teacher presentation.	Netiquette reading task and comprehension activities. Reading information from various websites especially childnet and CEOP.	The computational challenges given.	Information on the various websites that they use to gather research.	Information in the different scenarios that are then broken down and transferred into flow charts.
Examples of Key Tier 2 Vocabulary	Computer, sequence, data, policy.	Individual, factor, community, computer, communication, assume.	Thinking, cycle, investigation, project, criteria.	Purpose, audience, appropriate, data, format, create.	Process, create, function, chart, display, data.
Examples of Key Tier 3 Vocabulary	Network, username, password, root folder, sub folder, onedrive, email address.	SMART, netiquette, www, online.	Decomposition, algorithm, abstraction, pattern recognition.	Boolean expressions, search engine, web spiders, software, programs.	Decision, variables, input, output, data flow.
Examples of Numeracy	N/A	N/A	Sequences in problems. Numerical challenges.	Numerical data in the research they gather.	Using delays in Flowol. Using the correctly numbered inputs and outputs in Flowol.

Year 7

Unit Title	Networks	Animation	Programming in Scratch 1	Using Media
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Pupils will look at what a network is in terms of a computer network, wired and wireless, advantages and drawbacks of a network. Pupils will also investigate what the internet is and the world wide web and how they are different. They will look at how data travels along a network in packets and how this process works.	Pupils will look at animation techniques and be able to design and create a short animation for a given scenario.	Pupils will look at the 3 programming constructs of sequence, selection and iteration by designing and creating program sin Scratch that help show how programs are put together. They will then produce a game that uses the skills and knowledge developed in the unit.	Pupils will look at developing their IT and digital literacy skills. Pupils will look at how to search information efficiently, how to check for bias and reliability when reading information they find. Pupils will look at fake news and the impact this can have. Pupils will look at how images are gathered and the legal implications of gathering images from online sources. Pupils will look at what copyright law is and how creative commons licenses are used.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	A network has 2 or more computers connected together. A wired network uses a modem to connect the devices on a network. The internet is the structure of connected devices and was created in the 1970s. The world wide web are the websites/information that people can access because of the infrastructure set up by the Internet. When data is sent along a network it is broken down into packets which are small (usually 1kb) in size. When they get to the destination computer they are collated together in number order and the data then appears to the user.	An animation is an optical illusion because an animation is made up of still images that change at high speeds. This causes the illusion of movement. Frame rate means the speed at which images are shown. Transition means the way the image moves to the next image. A storyboard shows each stage of the animation and will give information about the audio, script, camera angles, timings.	Programming constructs are the building blocks to all computer programs. Sequence means putting commands in a logical order. Iteration means to repeat instructions or a loop. Count controlled loops will; repeat actions for a set number of times. Condition controlled loops will repeat actions whilst a certain condition is met (True). Selection means a choice and allows the user to control the direction of the program. A variable is a memory location in a program that stores data whilst the program is running. This data can be changed as the program is running.	When researching information online you should always think of CARS – credibility, accuracy, reliability and support. Bias means the information being read has a prejudice for or against the topic or group of people or idea being discussed. Copyright covers film, TV, sounds, music, literary works, original art. Creative Commons license allow a person to use information they gather but they must follow certain rules. Rules range from acknowledging the creator to not being able to edit it to not being able to make money from it.

Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Pupils demonstrating how packets of data travel and collate. Produce a timeline of the history of computers and networks. Completing task sheets in Teams based on lesson discussions and demos.	Peer assessment on storyboard designs so the critical information a storyboard needs is there. Pupils will create their animation based on their storyboard.	Debugging by identifying and correcting errors in programs. Problem solving by being given an instruction and pupils work out the commands to use. Create programs showing the 3 programmi9ng constructs in action.	Pupils will be shown techniques for searching for CC licensed image. Pupils will have to judge websites and their information using CARS (websites will be fake and aimed at seeing if pupils are checking.
Examples of Reading Opportunity	Wired or Wireless? Read scenarios and decide which type of network is best suited.	Research into different animation techniques.	Computational Fairy Tales: *Loops and making horseshoes* *The if-else life of the King's turtle*	Jules-Ferry in Crets en Belledonne *Newspaper article*
Examples of Key Tier 2 Vocabulary	Data, distribution, resources, communication, network, transport, media.	Interpret, export, distribute, format, refine, device, visual, image, transition.	Computer, input, output, process, flow, data, function, derive.	Copyright credible, source, plagiarism, fake news, reference, legislation, legal.
Examples of Key Tier 3 Vocabulary	Network, packets, addressing Internet, world wide web, protocol, bandwidth, TCP, IP, HTTP, IOT	Frame, app, frontend, android, iOS, wireframe, platform.	Program, sequence, iteration, variable, function, algorithm, selection, clone, event, condition, variable	Creative commons License, attribute, creator.
Examples of Numeracy	Producing a timeline of the history of computers and working out dates.	Frame rate, number of frames needed.	Using count-controlled loops, delays, degrees for positioning the sprite on the stage.	Checking dates and figures in the information gathered.

Year 8

Unit Title	Computer Systems	Computational Thinking	Online safety	Impact of Technology on Society	Tinkercad	Logic Gates
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Pupils will look at what a computer is and look at the I/O model of a computer. Pupils will explore how the hardware and software work together controlled by the CPU. Pupils will be introduced to binary and the look at how computers use binary to communicate and why.	Pupils will look at what computational thinking is and where it can be used. Pupils will look at what the different stages of computational thinking are (decomposition, abstraction, pattern recognition and algorithms) and be able to use them to solve a range of different tasks.	Pupils will look at what a digital footprint is and how they are created. Pupils will think about acting responsibly online and look at their online identity and how to protect it. .	Pupils will look at the positive and negative impacts of technology. Pupils will look at the environmental aspect of technology, e-waste, automation, artificial intelligence and smartphones.	Pupils will look at how to use 3D modelling in a program called Tinkercad and will look at real world uses of 3D modelling and the impact it can have.	This unit builds on the Computer Systems unit and looks at how logic gates are used as part of the circuitry of a computer. Pupils will look at how using binary certain gates will allow data to pass through or not.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	Computers that we use follow the structure called I/O model which stands for input output model. Data can be numbers, letters, characters that have no meaning. Information is data that has been processed and given a meaning. Input allows data to be entered into a computer system. Output devices give out information as words, images, sounds, movements etc. Binary is the language of a computer and is made up of 1s and 0s. Denary is used by	Computational thinking is about you can solve problems by breaking the problems down and looking for patterns and coming up with a solution that is clear and simple to follow. Computational thinking applies in school for all subjects but also can help with issues outside of school. Decomposition means to break a problem down into smaller bits so that it helps you see a possible solution. Abstraction means to remove any unnecessary detail that is not needed in the solution of the problem.	A digital footprint is a trail of the online activity that you have carried out. An online identity is the identity that you establish in online communities. A digital footprint is more difficult to get rid of and delete. History and cookies can be deleted but it is more difficult to delete your use of accounts. Netiquette are the rules of how you should behave and act when using online communities.	Artificial Intelligence is technology that enables a computer to act in a more human like manner. Automation is a wide range of technologies that reduce the amount of human interaction in the process as programs are followed. e-waste is any electronic items that have a plug, components and cords. The digital divide is the gap between those people with internet access and	3D printing is the transformation of a virtual 3D model into something you can hold in your hand. Scale - Used to measure and compare the size of an object. Workplane – this is the grid where you will work on your design. To be able to say how real world areas such as health, architecture could make use of 3D modelling.	Logic gates are the building blocks of digital circuits. AND gate will only allow data to be outputted from it if both inputs are 1. AND gates require 2 inputs. OR gates require 2 inputs. OR gates will allow data to be outputted if either of the inputs are 1. NOT gates require 1 input. If the input in a NOT gate is 1 then the output will be 0. It does the opposite.

	humans and is also known as base 10 and is based on digits 0 to 9.			those who do not have access.		
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Completion of activities on Teams. Pupils acting out how a CPU works. Identify input and output devices.	Analyse a problem Pick out the most important information Work out how to solve the problem	Completion of Teams activities. Class and small group discussions.	Completion of Teams activities. Class and small group discussions.	Completion of tutorials. Produce a 3D model bauble using the school 3D printer. Completion of Teams activities.	Put logic gates circuits together using simulation websites. Completion of Teams activities.
Examples of Reading Opportunity	Check the specs. Reading specifications of computers to extract common information. Deriving the common components of all computers	The computational challenges given.	Netiquette rules. Research gathered through searching websites.	Research about various issues.	Tutorial instructions.	Reading the scenarios that pupils will need to put into circuits using the correct gates.
Examples of Key Tier 2 Vocabulary	System, general-purpose, machine, hardware	Thinking, cycle, investigation, project, criteria.	Individual, factor, community, computer, communication, assume.	Impact, society, identify, issue, principle.	Design, process, concept, construction, criteria, technical.	Design, analyse, interpret, precise, identify.
Examples of Key Tier 3 Vocabulary	Processor, memory, storage	Decomposition, algorithm, abstraction, pattern recognition.	Netiquette, www, online.	e-waste, automation, artificial intelligence, environmental.	3D modelling, work plane, step, rotate, scale, mirror, flip.	Logic gate, AND, OR, NOT, circuits.

Year 8

Unit Title	Data Representation	Spreadsheets	Python Programming using TuringLab	Physical Computing using Microbit	Image Handling
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Pupils will build upon the Computer Systems unit and look at how data is represented in computer systems using binary. Pupils will look at how text, images and sounds are represented and how a computer sees text/images/sound compared to how humans see them.	Pupils will look at data handling using a spreadsheet. They will develop their skills by looking at how a spreadsheet can manipulate number data, use formulae, produce graphs and model different scenarios using data inputted in.	Pupils will build upon the programming unit from Year 7 by looking at text based programming languages, in this case Python. Pupils will use Turing Lab and a farmbot robot and will be introduced to the basics of text based programming by selecting commands and then eventually typing in commands that control the farmbot robot.	Pupils will look at what physical computing is and will use a microbit to explore how to program the device. Pupils will use the knowledge gained from the Python unit and see how similar different program languages can be.	Pupils will look at digital images and look at what they are, how they are made up in terms of pixels and differences between bitmap and vector images. Pupils will look at how images can be edited using Photoshop. Pupils will also explore the moral and ethical issues related to image editing.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	Binary is the language used by computers to communicate and send/receive data. Hexadecimal is base 16 and used to represent more complex binary numbers. IT is used by humans as computers only understand binary. Pixels are small squares of colour that make up an image. Metadata is data about data. It gives information about the number of colours in the image, the size dimensions of the image and the binary for each pixel that makes up the image. ASCII shows you the binary for the characters in the	A spreadsheet is used to enter, edit and manipulate numbers. Formatting is used to change how a spreadsheet looks. A formula is a calculation. A formula must always begin with an = sign. A graph is used to represent numbers in picture form. Every cell has a name and this is made up of the column letter and the row number. Conditional formatting is used to format cells by changing the fill colour or text style and the cells change according to rules that you set.	A computer program is a set of instructions that tell a computer what to do. A command is an instruction that tells the computer to perform a certain action. A function is are commands that allow you to perform a specific action without having to write lots of code. A variable is a memory location in a program that stores one piece of data but that data could change as the program runs. A constant is a memory location in the program that can hold data but this data will remain the same throughout the program.	The microbit can use different programming languages to run but we use Python because it is very close to our natural language in terms of the commands they use. Display.scroll() is used to scroll words or numbers across the LED screen. Display.show() is used to display an image on the LED lights. Display.clear() will clear whatever is on the LED lights. The microbit is like any computer device in terms of accepting input, processing the input and outputting information to the LED lights.	A bitmap image is an image made up of pixels. A pixel is a square of colour. A vector image is made up of mathematical formulas and lines and shapes. There are 5 purposes of graphics – educate, inform, entertain, advertise, influence. Ethical/Cultural issues caused by altering images are - misrepresentation/self-esteem/unrealistic expectations . An image made in Photoshop is made of layers. A layer is one part of the image. Using more than one layer is called a composition. The Advertising Standards Agency look into images used

	alphabet, special characters and punctuation.		Debugging is used to find errors in your program and to fix them. Logical errors happen when your program works but not in the way you expected it to. The commands are right but it does not do what you expect. A syntax error is a mistake with the programming commands you have used such as a spelling error or incorrect		in advertising across all media and can fine anyone breaking rules. When gathering images you must be careful to follow Copyright rules and the rules of Creative Commons licenses.
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Pupils will design a bitmap image and plan it out using binary to show the colours used. Be able to calculate the size of an image. Use whiteboards to calculate binary to denary and denary to binary.	Be able to enter numerical data and manipulate using formulae. Enter data and create graphs. Be able to label a graph correctly.	Be able to follow the instructions that start off with click and drag and then get more difficult as more of the activities are completed. Be able to type commands to control the robot in Python language.	Being able to debug code given by spotting the syntax errors and logical errors (more challenging) Be able to translate code into everyday language to explain what the code will do.	Be able to apply knowledge gained in lessons on a variety of given images. Be able to join in class and pair discussions about the ethical/moral use of image editing tools.
Examples of Reading Opportunity	Check the specs. Reading specifications of computers to extract common information. Deriving the common components of all computers	Spreadsheet Facts Paired reading task to find key facts about spreadsheets and why they are useful.	The impact of intensive farming and the impact technology has had on farming.	David vs Goliath: smallholder farmers in Columbia stand up for their rights. Programming short stories.	AI Generated Images news articles.
Examples of Key Tier 2 Vocabulary	System, general-purpose, machine, hardware	Spreadsheet, calculation, column, row, primary, secondary, source	Method, design, error, precise, file, unique, sequence, interpret.	Method, design, error, precise, file, unique, sequence, interpret.	Design, image, orientation, perspective, styles, alter, dimensions, implications.
Examples of Key Tier 3 Vocabulary	Processor, memory, storage	Cell, formula, function, conditional formatting, autofill,	Command, function, algorithm, string, variables, syntax, debugging, sequencial.	Display, scroll, sleep, accelerometer, LED, logic, execute, processor, input, iteration, selection.	Bitmap, pixel, hue, saturation, levels, filters, layers, lasso, transform, scale, rotate.

Year 9

Unit Title	Cyber Security	3D Design Project	Python Programming	Mobile App Project	Practical Algorithms	Web Development
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Pupils will look at the types of threats to computer systems and ways to prevent them.	Pupils will look to build upon the 3D design unit from Year 8 and look at how they can use 3D design to help solve a real world problem. 9group work and project supplied by BAE)	Pupils will write short Python programs which use input output, casting sequences, selection and iteration. Pupils will use the knowledge gained in the introductory unit in Year 8.	Pupils will plan, design and make a mobile app. Pupils will follow the structure used in Creative iMedia to introduce pupils to the alternative GCSE course in Key Stage 4.	Pupils will look at sorting and searching algorithms and look at how a computes carries out these techniques. Pupils will loom at this in a practical, hands on way.	Pupils will plan, design and make a 3 page website for a specific audience and purpose. Pupils will look to use a combination of html and design features built into the web making program.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	A virus is self-replicating and causing harm to computer systems. A worm spreads through exploiting security loopholes in networks. Anti malware is software which identifies and removes a number of types of malware.	A part is the smallest piece of a design with a single material, that is produced using typical manufacturing processes. In order to create a model of a part, you must visualize and build the geometry by using a series of 'building blocks' offered in the CAD system. These basic building blocks are sketches and features	Iteration is when a program repeats a block of code. Selection is when the program uses a condition to decide which code to run next. Python is case-sensitive so that Print and print are different. A function is a named block of code which carries out a specific task when it is called.	App is short for Application. An application is software. Software are programs and programs are instructions that tell a computer what to do. Pre-Production is the stage that happens before production and involves design documents such as a mind map and visualisation diagram. A navigation chart shows the different pages in the app and how the pages are linked together.	A searching algorithm allows a set of data to be examined and for a specific item to be found. A sorting algorithm allows a data set to be sorted into order. A merge sort uses divide and conquer to split data in pairs and then compare the pairs to each other. Binary search is used to search an ordered list for the data needed. Linear search is the simplest search method and each item of data is looked at and once the match is made the search stops.	When designing and making a website the industry standard is that users must be able to find what they are looking for in 3 clicks or less. A hyperlink is a button/image/text that takes the user to the webpage they are looking for. HTML stands for hypertext Markup Language and is the programming language websites and web pages are written in. A website is a collection of web pages.

Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Use websites to check password security and investigate strong passwords. Use of videos and class/peer discussion on cyber crimes. Using scenarios based on the computer misuse act to give advice and sanctions.	Working in teams with designated roles Communicating the design process and how the product meets the stated need. Present to the class to show what their group has achieved.	Being able to debug code given by spotting the syntax errors and logical errors (more challenging) Be able to translate code into everyday language to explain what the code will do. Use of PRIMM activities to develop programs.	Peer assessment of app designs. Practical lessons where pupils are making the app. Class/peer discussions about what an app is and successful app features.	Practical search and sort activities completed individually as well as in pairs. Teams activities aimed at exploring the different searches and sorts.	Peer assessment of webpage designs. Debugging of html code to spot common errors. Teacher modelling techniques to make the pages and show misconceptions pupils may come across.
Examples of Reading Opportunity	The impact of data mining in terms of bit coin.	Research gathered and the task booklet given to pupils and groups.	Programming short stories.	The effect of screen time on our health, both physical and mental.	How search engines work articles.	Online Safety Bill: divisive internet rules become law news articles.
Examples of Key Tier 2 Vocabulary	Individual, policy, strategies, security, legislation, attitudes, error, awareness.	Design, dimension, analyse, approach, concept.	Design, analyse, interpret, precise, identify, data, sequence.	Structure, source, section, design, audience, purpose, function, create.	Precise, sort, search, approach, analyse, strategies.	Structure, source, section, design, audience, purpose, function, create.
Examples of Key Tier 3 Vocabulary	Malware, virus. Social engineering, distributed denial of service attack (DDOS),	Plane, sketch, extrude, chamfer, constraint, prototype.	Casting, iteration, selection, Syntax, print, shell, IDE, debugging,	Android, iOS, frontend design, prototype, native app, platform.	Linear, binary, bubble sort, merge sort, insertion sort.	HTML, opening tags, closing tags, <>, script.

Year 10

Unit Title	1.1 Architecture of the CPU	1.2.1, 1.2.2 Memory and Storage	1.2.3, 1.2.4, 1.25 Units and Data Representation	1.3.1 Networks and Topologies	1.3.2. Wired and wireless networks, protocols and layers
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	What are the main components of the CPU and how do they work together to run programs? What effects CPU performance? What is an embedded system and why is it different to a general purpose computer?	What is the difference between primary and secondary storage? Why do we need more than one type? What are the common types of secondary storage and their characteristics.	How do computers store integers, images and sounds? How do we measure the amount of storage used? Why do computer use binary? What is data compression and why do we need it?	What is a computer network and what hardware is needed for one to function? What are the types of network and how do we distinguish between them? What roles can different computers take in a network? How does the internet work?	What technologies are used to connect networks? What are their characteristics? What are the common protocols used in networking and what are they used for? What is a layer and why are they used in protocols?
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	The key components are the control unit, the arithmetic and logic unit, cache and registers. The control unit coordinates the step by step running of the CPU, sending out control signals to all other parts and decoding instructions during the FDE cycle.	RAM and ROM and primary storage (memory). RAM is used to store data and programs currently in use. Secondary storage is for long-term (non-volatile) storage of data. Solid state storage has the fastest access times and is very robust. Magnetic storage has the highest capacity.	Computers use binary because it matches the way the internal circuits work (2-state, on-off matches 1 and 0). Different types of data use different binary encoding methods. Sound is sampled multiple times a second and the amplitude of the sound wave is measured and stored as a binary code. The higher the sample rate the more closely the digital sound resembles the originally (analogue) sound.	A LAN connects devices a small geographical area and does not use externally owned infrastructure. A WAN covers a large geographical area – the internet is the largest possible WAN. In a client-server network a server offers services ,such as file storage and printing, to clients. A router connects different networks, e.g. a school LAN to the internet. It examines packets and routes them according to the IP address of the destination.	Networks can connect used wires and wireless. The two main wireless technologies are wi-fi and Bluetooth. Ethernet is a networking standard for wired networks because it is reliable and has become ubiquitous. A protocol is a set of rules which govern how devices communicate on a network. Each protocol serves a specific purpose. POP and IMAP are used to access emails on a mail server. SMTP is used to send emails. Encryption is essential in wireless communications in order to keep the data secure.
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Animation to show how the FDE cycle works. Pupil and teacher demos of the FDE cycle and the differences between memory and storage.	Sorting devices to be either memory or storage. Teams activities and exercise book notes designed to understand the differences between memory and storage.	Use of whiteboards to calculate binary, denary and hexadecimal. Use of past exam questions to look at binary addition and shifts left/right.	Practical activities to help build different network topologies to help understand them more. Exercise books to make notes on what a network is and the benefits and drawbacks.	Exercise books to build up notes about the topic. Scenarios given to pupils whop then advise about the type of network to use and protocols that should be applied.

Examples of Reading Opportunity	Pre-reading: Architecture of the CPU	Evolution of storage devices	Various exam question styles. How computers work research.	The Internet – Key Ideas	Research about networks from various sites.
Examples of Key Tier 2 Vocabulary	Architecture, execute, purpose, role, function	Storage, memory, characteristics, purpose, embedded	place value amplitude, code, convert	Medium/media	Protocol, standard
Examples of Key Tier 3 Vocabulary	ALU, cache, accumulator, cores, Hertz, GHz	Volatile, access times, RAM, cache, embedded system	Encode, Pixel, colour depth, bit depth, binary, megabyte, shift, lossless compression	LAN, WAN, switch, router, hosting, DNS, the cloud	Protocol, wi-fi, Bluetooth, encryption, TCP/IP, HTTP, POP

Year 10

Unit Title	1.6 Ethical, legal, cultural and environmental impact (taught over Y10 & Y11)	2.1.1 Computational Thinking	2.1.2 Designing, creating and refining algorithms	2.2.1, 2.2.2 Programming Fundamentals & Data Types
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	What are the ethical, legal, cultural, environmental and privacy issues to do with digital technology? What is the impact of technology on wider society? What legislation is relevant to Computer Science and how do laws impact on organisations and individuals.	What are the principals of computational thinking and how are they used to solve problems.	Write algorithms using pseudocode, flowcharts, OCR's reference language and Python	Write a program to solve a set problem.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	The use of technology and increase in the amount of devices is having a major impact on the environment. Computers and smartphones use a huge amount of precious metals and other materials in their manufacture. They are not easy to recycle and when dumped have a devastating affect on the environment and people's health. The use of technology has led to a decrease in people's privacy. Access to inappropriate materials is a growing issue for young people.	Decomposition is breaking down a problem into smaller parts which are easier to solve. Pattern recognition helps us spot how things work and aid problem solving. Abstraction is focussing on the important parts of the problem and ignoring the parts which do not affect the solution. A good example is how we represent a map on paper or using a computer.	Follow the flow of control through a flowchart which includes loops, selection and sub-programs. Create a flowchart A syntax error is where the code does not follow the rules of the language. A logical error is where the code is technically correct but does not produce the expected output.	The use of variables, constants, operators, inputs, outputs and assignments The use of the three basic programming constructs used to control the flow of a program: Sequence, Selection, Iteration (count and condition- controlled loops) The common arithmetic operators (+, -, *, /, DIV, MOD, ^) The common Boolean operators AND, OR, NOT Casting is used to change a variable from one data type to another. Data types are integer, real, boolean, character and string.
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Class and peer discussions ab out the different ethical/moral considerations etc. Use of videos of real world examples of issues.	Solving problems across a range of scenarios. Pair and class discussions to solve a range of challenges. BEBRAS UK challenges.	Exercise books building up notes about the techniques. Whiteboards and practical activities to carry out the different searching and sorting algorithms needed for the course.	Use PRIMM methodologies to explore code, modify code and then write code from scratch.

Examples of Reading Opportunity	Case studies of the different areas.	Various computational thinking challenges.	Exam questions. Reading different scenarios that are then put into an algorithm.	Programming challenges that are then interpreted into programming code.
Examples of Key Tier 2 Vocabulary	Ethical, cultural, Legislation, impact, proprietary	Design, analyse, create, function, identify, thinking, problem solving.	Precise, sort, search, approach, analyse, strategies, design.	Design, analyse, interpret, precise, identify, data, sequence.
Examples of Key Tier 3 Vocabulary	Data protection act, Computer misuse act, Open-source Proprietary	Abstraction, decomposition, pattern-recognition,	Selection, IF, input, iteration, loop, sub-program	Syntax error, logic error, casting, selection, iteration, Boolean

Year 11

Unit Title	1.4.1, 1.4.2 Threats to computer systems and networks; Identifying and preventing vulnerabilities	1.5 Operating systems and utility software	2.4.1 Boolean Logic	2.1.3 Searching and Sorting Algorithms	2.2.3 Additional programming techniques: Using text files	2.2.3 The use of SQL to search for data
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	What are the forms of attack? How do we prevent attacks or lessen the chances of damage?	What is the purpose of an operating systems and what specific functions does it carry out? What is the purpose and functionality of utility software?	Given a logic circuit or expression :- what will be the given output for all possible inputs? what will the logic circuit look like?	Different algorithms exist for sorting and searching data. Each varies in complexity and efficiency.	Programs need to be able to write data to secondary storage for permanent storage	SQL is used to search databases.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	Malware is malicious software. It includes virus, worms and trojans. Malware can be prevented by using up-to-date anti-malware software and firewalls. Social engineering is about tricking people in some way in order to gain access to systems or personal data. It includes, phishing and shoulder-surfing. Data interception can be prevented by encrypting the data so that it is not understandable if stolen.	An OS manages the way a computer can be used. It provides memory management: allocation RAM to applications and data as necessary and moving data between virtual memory and RAM when required. It provides a user interface – a way for users to interact with the computer. Utility software helps maintain a computer and keep it working efficiently. Defragmentation software rearranges files on secondary storage to ensure that	Each logic gate has a unique written symbol and is drawn with a unique shape. A not gate has the shape and represented by the ¬ symbol. The output from an AND gate is only a 1 (True) if both inputs are 1 otherwise it is a 0 (False) If a logic circuit has 2 inputs there are 4 (2^2) possible outputs -so 4 lines to the truth table. For 3 inputs there are $2^3 = 8$ possible outputs.	Linear search can be used on any data; it is necessary for searching unsorted data. Binary search uses a "divide and conquer" method. It is far more efficient than linear search but only works on sorted data. Merge sort is a *recursive* sorting algorithm based on two intuitive principles: 1) It is easy to sort very short lists. In fact, it is trivial to sort lists containing only one item. 2) It is easier to merge two	Write strings to a text file from variables and arrays. Read data from a text file into one or more data structure.	A search expression is made up as follows SELECT *list of fields* FROM *table name* WHERE *search criteria* * is used as a wildcard to represent all fields in a SELECT statement or with a LIKE keyword surname LIKE "A*" means any surname starting with an A
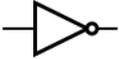
		files are stored contiguously and that free space is all in one place.		sorted lists than to sort a long list.		
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Exercise books to build up notes. Real world examples and use of videos to help show different examples. Use of exam questions to help cement understanding.	Exercise books for building revision material. Use of whiteboards for knowledge retrieval.	Whiteboards for drawing different gates and circuits. Use of exam questions to help with exam technique.	Practical search and sort activities completed individually as well as in pairs. Teams activities aimed at exploring the different searches and sorts.	Use PRIMM methodologies to explore code, modify code and then write code from scratch.	Use PRIMM methodologies to explore code, modify code and then write code from scratch. Debug code to show errors can be recognised.
Examples of Reading Opportunity	SQL Injection Attack: Real Life Attacks	Research from various websites.	Different scenarios and be able to interpret and put into logic gates and/or circuits.	Merge Sort and Lines of Kindergarteners *Computational Fairy Tales*	Programming challenges that are read and interpreted to make programs that do what the client wants.	Programming challenges that are read and interpreted to make programs that do what the client wants.
Examples of Key Tier 2 Vocabulary	Individual, policy, strategies, security, legislation, attitudes, error, awareness.	Computer, instructions, design, access, program, purpose, user.	Circuit, logic	Sort, search, linear, merge, insert	Structure, function, data, access.	Search, expression
Examples of Key Tier 3 Vocabulary	Malware, virus, worm, trojan, social engineering, distributed denial of service attack	Operating system, utility, software, program.	Operations, logic gate, logic circuit, logical operators, truth table	Bubble sort, insertion sort, merge sort, binary search	Data types, CSV, text, array, variables, lists.	Wildcard SELECT, FROM, WHERE

Year 11

Unit Title	2.2.3 Additional programming techniques - Arrays	2.2.3 Additional programming techniques – sub programs	2.3.1 Defensive design	2.3.2 Testing	2.5.1 Languages	2.5.2 The Integrated Development Environment (IDE)
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Can create and use one- and two-dimensional arrays to store structured data and use them to solve problems.	Can create sub-programs as functions which return a value and as procedures which complete a tasks	Programs need to be designed to anticipate misuse and cope with erroneous inputs. Programs should be written so that they are easy to maintain.	The purpose of testing is to help the programmer remove such bugs and to ensure that the program functions as intended.	Low-level languages work at the level of the processor and require knowledge of the architecture including register names. High-level languages are understandable by humans but need to be translated using software in order to run.	An integrated development environment (IDE) is software that includes various features to help a programmer develop their program code.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	Arrays and Lists are zero-referenced so the index f the first item is 0 and not 1 Arrays store one data type but lists can store data of different types. Lists are dynamic and can change size. An array has a fixed size.	A sub-program is a named section of code which has a specific purpose. Some sub-programs return a value, these are known as functions. In Python we create a function using the **def** keyword def my_function(): # code is here	Validating user inputs is a good way to check that the data entered is sensible. Casting incompatible data can cause crashes and using a TRY … EXCEPT construct ensures programs are robust. Sub programs help structure code and aid maintainability. The use of comments lets other programmers understand the purpose of code.	Test data can be classified as normal, boundary, erroneous and invalid. All types need to be used when testing a program. Iterative testing occurs during development when each unit of code is written, tested and refined until it is correct. Final testing ensures that all sub programs work together correctly.	Machine code is pure binary and is the only language which can be executed directly. Assembly language uses mnemonics – one per machine code instruction. An assembler translates assembly language into machine code. High level languages are translated by a compiler or interpreter.	Most IDEs will include facilities such as automatic formatting and debugging tools such as break points. They allow code to be executed within the IDE by including an interpreter or compiler. This is known as a run-time environment. Most IDEs will colour code keywords and use highlighting to enable the code to be better understood.

						IDEs include text completion to save time in development.
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Use PRIMM methodologies to explore code, modify code and then write code from scratch.	Use PRIMM methodologies to explore code, modify code and then write code from scratch.	Use PRIMM methodologies to explore code, modify code and then write code from scratch.	Use PRIMM methodologies to explore testing tables and testing methods.	Exercise books to build up revision notes. Whiteboards to c heck understanding of low and high level languages.	Be able to identify different sections of the IDE. Exam questions to help check understasnding.
Examples of Reading Opportunity	Programming challenges that are interpreted and put into programming language and testing. Exam questions of different styles. Programming short stories.					
Examples of Key Tier 2 Vocabulary	Method, design, error, precise, file, unique, sequence, interpret, tables.	Method, design, error, precise, file, unique, sequence, interpret.	Misuse Authentication	Normal Boundary invalid	translate	Automatic formatting
Examples of Key Tier 3 Vocabulary	Array, list, dynamic, static, index	Sub-program Function Procedure Return value Parameter	Indentation Sub program Function Procedure	Normal Boundary Invalid Erroneous	Machine code Assembly language Assembler Compiler Interpreter	IDE – integrated development environment Run-time environment Debugger Syntax error
Example of Specific Guided Reading Task	Please see our subject's guided reading document for detail of reading tasks in Year 11 (hyperlink)					
Summative Assessment	Please see our subject's assessment document for detail of assessment in Year 11 (hyperlink)					
Personal Development	Please see our school's personal development webpage for examples of personal development in Year 11 (hyperlink)					
Careers/Futures	Please see our subject's careers document for examples of careers in Year 11 (hyperlink)					