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

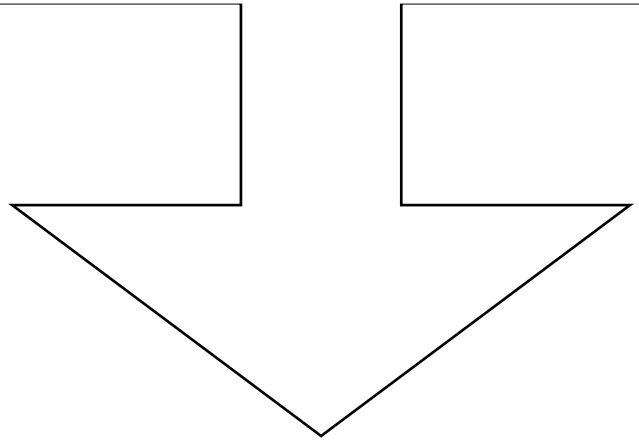
Key Substantive Knowledge Carried Forward (subject knowledge)

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	Using Documents	Computational Thinking	Networks	Programming in Scratch 1	Using Media
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Confident in using school IT systems Knows or can find email address Has a framework for being safe online	Developing IT and digital literacy skills	Can solve problem through abstraction, decomposition and pattern recognition	What are the "internet" and "World Wide Web"? What are the key services and protocols used?	Design and create an interactive game which uses events	Developing IT and digital literacy skills Understanding licensing issues involving online content
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	Understands the importance of keeping personal data private and to contact a responsible adult if anything is wrong online. Organising folders	Can use a search engine to find information on a specific topic		The internet is a global network of networks. The WWW is one of the services on the internet.	Use sequences of instructions, iteration and selection. Using decomposition to break down problems. Understand that a variable is a named store for data in a computer's memory.	Create a digital artefact (blog post) appropriate for a selected audience using Sway
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Access work from home and at school using One Drive, Teams and Microsoft365.com	Can use a word processor to create and format documents Save and retrieve work using One Drive Use Class Notebook to capture learning	Analyse a problem Pick out the most important information Work out how to solve the problem		Identifying and correcting errors in programs Problem solving Create and use variables	Searching for CC licensed images
Examples of Reading Opportunity	SMART Rules	Information on websites: For animal fact sheet; For holiday presentation	Problem texts	Wired or Wireless? *Read scenarios and decide which type of network is best suited.*	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		Search Relevant paragraph		Network, services, hardware, address		Copyright credible, source, plagiarism, fake news, reference

Examples of Key Tier 3 Vocabulary		Application software Styles Heading Border Search engine	abstraction, decomposition, pattern recognition	Network, packets, addressing Internet, world wide web, protocol, bandwidth, TCP, IP, HTTP, IOT	Program, sequence, iteration, variable, function, algorithm, selection, clone, event, condition, variable	Creative commons License
Examples of Numeracy					Using count-controlled loops	

Year 8

Unit Title	Computer Systems	Spreadsheets	Online safety	Vector Graphics	Python Programming with FarmBot	Data Representation
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	How computing systems operate	To confidently model data with a spreadsheet	Everything we do leaves a digital footprint so we need to think carefully about our online activities.	We can create complex graphics using vector paths and objects and combining them.	Write a Python program which uses sequences of instructions and iteration and calls pre-built functions in order to solve a specific problem	Data is encoded using Binary for processing by computers. Whole numbers, text and images are all encoded differently. Bitmaps are encoded pixel by pixel while vectors are encoded use maths.
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	Describe the function of the hardware components used in computing systems and how they work together in order to execute programs	Create formulas and use functions to analyse data. Create suitable charts to display data.	Being careful with what we post online Knowing how to report concerns	Vector graphics are scalable, bitmaps are not. Bitmaps are made up of picture elements – pixels, the smallest editable part of an image.	A computer program is a set of instructions that tell the computer what to do. Iteration is the repeating of instructions – when we use iteration, we call it a “loop” Sequential programming means code runs one line after another in the correct order	Binary is based on the number 2 so place values double as we move left. ASCII is a character code – it stores characters. The way data is encoded depends on the type of data: e.g., numbers, text and images are all encoded using different methods.
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)				Using vector tools to create and manipulate graphics	Writing and debugging Python programs.	Converting between number systems.
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.	Think U know website materials			

Examples of Key Tier 2 Vocabulary	System, general-purpose, machine, hardware	Spreadsheet, calculation, column, row, primary, secondary, source				Convert denary
Examples of Key Tier 3 Vocabulary	Processor, memory, storage	Cell, formula, function, conditional formatting, autofill,		Vector, path, object, node	Syntax Bug Debugging Function Argument Algorithm Sequence	Binary Ascii Pixel Bitmap vector

Year 8

Unit Title	Image handling	Animation	3D Modelling	Mobile App development	Physical computing with microBits.	
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	How to "photoshop" an image:- can enhance photos using editing tools and save in a suitable format	Can create frame-by-frame and animations created using "tweens".	Create a 3D model of a building and print the model	Create a mobile app using App Lab (code.org)	Program a physical device (micro:bit) to respond to button presses and using sensors.	
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	Can use layers to build up elements of the whole image. Can talk about the impact of "photoshopped" images on self-image	The difference between frame by frame and tweened animations	Manipulating objects in 3D space Construct a 3D model based on a design	Decompose a project into smaller, manageable parts. Implement and customise GUI elements to meet the needs of the user Use user input in an event-driven programming environment Use variables in an event-driven programming environment	Examples of events are button presses and sensors recording a particular value or range of values. An accelerometer measures the movement and orientation of a device such as a mobile phone. Program code can be linked to these movements.	
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Use layers and opacity to blend images Use layer masks to allow non-destructive editing	Use Animate to create animations	Use Tinkercad workspace to move, resize, place and rotate objects Create composite objects using simpler ones			
Examples of Reading Opportunity	https://www.bbc.co.uk/news/world-europe-41443027 https://www.bbc.co.uk/news/uk-wales-58153556 Effect of altered images on self-esteem and mental health.					

Examples of Key Tier 2 Vocabulary	Enhance, tools	Export animation	Perspective			
Examples of Key Tier 3 Vocabulary	Selection, feather, blend, layer, mask	Onion-skin symbol Warp tool Handle Key frame Motion tween	Placeholders Object Workplane	Event GUI Variable Sequencing Selection decomposition	Program, sequence, iteration, variable, , selection, event, condition	

Year 9

Unit Title	Cyber Security	3D Design Project	Computer Systems	Online safety	Python Programming	Computational Thinking
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	The types of threats to computer systems and ways to prevent them.	Design a prototype product to meet a stated environmental need.	How a computer system works and executes instructions	Recognise the signs that their relationship may be putting them at risk by recognising forms of exploitative behaviours.	Can write short Python programs which use input output, casting sequences, selection and iteration	Can use computational thinking techniques to break down problems and solve them.
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	The basic components of a CPU are a control unit, an ALU, registers, a clock and registers. A computer needs primary storage in order to run programs and secondary storage to store data in the long term.	In a good relationship, both people want what's best for each other. Some people make you think they are your friend, boyfriend or girlfriend, but really, they are using you e.g. for money, status or sex. Some people make young people feel special (e.g. giving them gifts or paying them compliments) in order to gain control over them. How to tell when a situation is unsafe, and set boundaries about what you want to do and don't want to do.	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.	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.

Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)		Working in teams with designated roles Communicating the design process and how the product meets the stated need.				
Examples of Reading Opportunity				Think U know website resources		Problems on Bebras and scenarios on Teach-ICT.
Examples of Key Tier 2 Vocabulary		Design, dimension	Process, execute, instructions	Exploitation Grooming Coercion	syntax	
Examples of Key Tier 3 Vocabulary	Malware, virus. Social engineering, distributed denial of service attack (DDOS),	Plane, sketch, extrude, chamfer, constraint	Control unit, cache, registers, arithmetic and logic unit		Casting, iteration, selection debugging	Abstraction, decomposition, pattern-recognition

Year 9

Unit Title	iDEA Award					
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	Gained a nationally recognised award.					

Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	*See example records of achievement*					
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Pupils work independently, with support where necessary, to read through the material for each badge and answer questions to show recall and understanding.					
Examples of Reading Opportunity	All material is presented through reading and some videos.					
Examples of Key Tier 2 Vocabulary						
Examples of Key Tier 3 Vocabulary	Specific to each badge					

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	1.6 Ethical, legal, cultural and environmental impact (taught over Y10 & Y11)
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?	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.
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	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	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	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

			higher the sample rate the more closely the digital sound resembles the originally (analogue) sound.	different networks, e.g. a school LAN to the internet. It examines packets and routes them according to the IP address of the destination.	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.	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.
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)						
Examples of Reading Opportunity	Pre-reading: Architecture of the CPU	Evolution of storage devices		The Internet – Key Ideas		Case studies of the different areas.
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	Ethical, cultural, Legislation, impact, proprietary
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	Data protection act, Computer misuse act, Open-source Proprietary
Example of Specific Guided Reading Task	Please see our subject's guided reading document for detail of reading tasks in Year 7 (hyperlink)					
Summative Assessment	Please see our subject's assessment document for detail of assessment in Year 7 (hyperlink)					
Personal Development	Please see our school's personal development webpage for examples of personal development in Year 7 (hyperlink)					
Careers/Futures	Please see our subject's careers document for examples of careers in Year 7 (hyperlink)					

Year 10

Unit Title	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 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)	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	Solving problems across a range of scenarios		Use PRIMM methodologies to explore code, modify			

(methods/framework to establish knowledge)			code and then write code from scratch.			
Examples of Reading Opportunity						
Examples of Key Tier 2 Vocabulary		Program, syntax, logic	Program, syntax, operator (operation)			
Examples of Key Tier 3 Vocabulary	Abstraction, decomposition, pattern-recognition,	Selection, IF, input, iteration, loop, sub-program	Syntax error, logic error, casting, selection, iteration, Boolean			
Examples of Numeracy			Using order of operations to calculate value of numeric expressions Using DIV and MOD, e.g., using MOD to find if an integer is odd or even.			
Example of Specific Guided Reading Task	Please see our subject's guided reading document for detail of reading tasks in Year 10 (hyperlink)					
Summative Assessment	Please see our subject's assessment document for detail of assessment in Year 10 (hyperlink)					
Personal Development	Please see our school's personal development webpage for examples of personal development in Year 10 (hyperlink)					
Careers/Futures	Please see our subject's careers document for examples of careers in Year 10 (hyperlink)					

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 files are stored contiguously and 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 sorted lists than to sort a long list.	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

		free space is all in one place.				
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)					Use PRIMM methodologies to explore code, modify code and then write code from scratch.	
Examples of Reading Opportunity	SQL Injection Attack: Real Life Attacks			Merge Sort and Lines of Kindergarteners *Computational Fairy Tales*		
Examples of Key Tier 2 Vocabulary			Circuit, logic	Sort, search, linear, merge, insert		Search, expression
Examples of Key Tier 3 Vocabulary	Malware, virus, worm, trojan, social engineering, distributed denial of service attack		Operations, logic gate, logic circuit, logical operators, truth table	Bubble sort, insertion sort, merge sort, binary search		Wildcard SELECT, FROM, WHERE
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)					

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 code, modify code and then write code from scratch.		
Examples of Reading Opportunity						
Examples of Key Tier 2 Vocabulary		sub	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)					