PROGRESS IN (SUBJECT), YEARS 7-11

Grade	Y11	Y10	Y9	Y8	Y7	AO1: Programming	AO2: Data Representation	AO3: Hardware and Processing	AO4: Networking
9						Top 20% of candidates who achieve grades 7-8			
8						Designs and writes nested modular programs that enforce reusability utilising sub-routines wherever possible. Understands the difference between While loop and For loop. Understands and uses two dimensional data structures.	Performs operations using bit patterns e.g. conversion between binary and hexadecimal, binary subtraction etc. Understands and can explain the need for data compression.	Has practical experience of a small (hypothetical) low level programming language. Understands and can explain Moore's Law. Understands and can explain multitasking by computers.	Understands the hardware associated with networking computer systems, including WANs and LANs, understands their purpose and how they work, including MAC addresses.
7						Appreciates the effect of the scope of a variable. Understands and applies parameter passing.	Knows the relationship between data representation and data quality. Understands the relationship between binary and electrical circuits, including Boolean logic.	Knows that processors have instruction sets and that these relate to low-level instructions carried out by a computer.	Knows the purpose of the hardware and protocols associated with networking computer systems. Recognises that persistence of data on the internet requires careful protection of online identity and privacy.
6						Uses nested selection statements. Appreciates the need for, and writes, custom functions including use of parameters. Knows the difference between, and uses appropriately, procedures and functions. Uses and manipulates one dimensional data structures. Detects and corrects syntactical errors.	Understands how numbers, images, sounds and character sets use the same bit patterns. Performs simple operations using bit patterns e.g. binary addition. Understands the relationship between resolution and colour depth, including the effect on file size.	Understands the von Neumann architecture in relation to the fetch-execute cycle, including how data is stored in memory. Understands the basic function and operation of location addressable memory.	Knows the names of hardware e.g. hubs, routers, switches, and the names of protocols e.g. SMTP, iMAP, POP, FTP, TCP/IP, associated with networking computer systems

5						Understands that programming bridges the gap between algorithmic solutions and computers. Has practical experience of a high-level textual language, including using standard libraries when programming. Uses a range of operators and expressions e.g. Boolean, and applies them in the context of program control. Selects the appropriate data types.	Knows that digital computers use binary to represent all data. Understands how bit patterns represent numbers and images. Knows that computers transfer data in binary. Understands the relationship between binary and file size (uncompressed). Defines data types: real numbers and Boolean. Queries data on one table using a typical query language.	Recognises and understands the functionof the main internal parts of basic computer architecture. Understands the concepts behind the fetch-execute cycle. Knows that there is a range of operating systems and application software for the same hardware.	Understands how search engines rank search results. Understands how to construct static web pages using HTML and CSS. Understands data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching.
4						Understands the difference between, and appropriately uses if and if, then and else statements. Designs, writes and debugs modular programs. Knows that a procedure can be used to hide the detail with sub-solution (procedural abstraction).	Performs more complex searches for information e.g. using Boolean and relational operators. Analyses and evaluates data and information, and recognises that poor quality data leads to unreliable results, and inaccurate conclusions.	Understands why and when computers are used. Understands the main functions of the operating system. Knows the difference between physical, wireless and mobile networks.	Understands how to effectively use search engines, and knows how search results are selected, including that search engines use 'web crawler programs'. Selects, combines and uses internet services.
3						Creates programs that implement algorithms to achieve given goals. Declares and assigns variables. Uses post-tested loop e.g. 'until', and a sequence of selection statements in programs, including an if, then and else statement.	Understands the difference between data and information. Knows why sorting data in a flat file can improve searching for information. Uses filters or can perform single criteria searches for information.	Knows that computers collect data from various input devices, including sensors and application software. Understands the difference between hardware and application software, and their roles within a computer system.	Understands the difference between the internet and internet service e.g. world wide web. Shows an awareness of, and can use a range of internet services e.g. VOIP.

2						Uses arithmetic operators, if statements, and loops, within programs. Uses logical reasoning to predict the behaviour of programs. Detects and corrects simple semantic errors i.e. debugging, in programs.	Recognises different types of data: text, number. Appreciates that programs can work with different types of data. Recognises that data can be structured in tables to make it useful.	Recognises that a range of digital devices can be considered a computer. Recognises and can use a range of input and output devices. Understands how programs specify the function of a general purpose computer.	Navigates the web and can carry out simple web searches to collect digital content. Demonstrates use of computers safely and responsibly, knowing a range of ways to report unacceptable content and contact when online.
1						Knows that users can develop their own programs, and can demonstrate this by creating a simple program in an environment that does not rely on text. Understands that programs execute by following precise instructions.	Recognises that digital content can be represented in many forms. Distinguishes between some of these forms and can explain the different ways that they communicate information.	Understands that computers have no intelligence and that computers can do nothing unless a program is executed. Recognises that all software executed on digital devices is programmed.	Obtains content from the world wide web using a web browser. Understands the importance of communicating safely and respectfully online.