



COMPUTER SCIENCE

EXAM BOARD: PEARSON EDEXCEL

	SKILL: DEMONSTRATE KNOWLEDGE AND UNDERSTANDING (AO1) <i>Demonstrate knowledge and understanding of the key concepts and principles of computer science</i>	SKILL: APPLY KNOWLEDGE (AO2) <i>Apply knowledge and understanding of key concepts and principles of computer science</i>	SKILL: ANALYSE PROBLEMS (AO3) <i>Analyse problems in computational terms:</i> <ul style="list-style-type: none"> To make reasoned judgements To design, program, evaluate and refine solutions
+ 9 -	Demonstrate exceptionally relevant and comprehensive knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.	Exceptionally and effectively apply fundamental concepts, principles and mathematical skills, using sustained analytical, logical and evaluative computational thinking, to a wide	Exceptionally develops and refines a complete solution that meets the requirements of a substantial problem.
+ 8 -	Demonstrate relevant and comprehensive knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts. <ul style="list-style-type: none"> Understands and can explain Moore's Law. Understands and can explain multitasking by computers. Understands the purpose of networking hardware and how they work, including MAC addresses. Understands the hardware associated with networking computer systems, including WANs and LANs. Understands the existence of legal frameworks governing information technology e.g. Data Protection Act, Computer Misuse Act, Copyright etc. Understands the ethical issues surrounding the application of information technology. 	Effectively apply fundamental concepts, principles and mathematical skills, using sustained analytical, logical and evaluative computational thinking, to a wide range of complex problems. <ul style="list-style-type: none"> Understands the difference between 'While' loop and 'For' loop, which uses a loop counter. Understands and can explain the need for data compression and performs simple compression methods. Performs operations using bit patterns e.g. conversion between binary and hexadecimal, binary subtraction etc. Knows what a relational database is and understands the benefits of storing data in multiple tables. Has practical experience of a small (hypothetical) low level programming language. 	Develop and refine a complete solution that meets the requirements of a substantial problem. <ul style="list-style-type: none"> Designs a solution to a problem that depends on solutions to smaller instances of the same problem (recursion). Designs and writes nested modular programs that enforce reusability utilising sub-routines wherever possible. Understands and uses two-dimensional data structures.



Subject Assessment Grid

<p>+ 7 -</p>	<p>Demonstrate detailed and appropriate knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.</p> <ul style="list-style-type: none"> • Knows the purpose of the hardware and protocols associated with networking computer systems. • Understands the client-server model including how dynamic web pages use server-side scripting and that web servers process and store data entered by users. • Recognises that persistence of data on the internet requires careful protection of online identity and privacy. • Explains and justifies how the use of technology impacts on society, from the perspective of social, economic, political, legal, ethical and moral issues. 	<p>Appropriately apply fundamental concepts, principles and mathematical skills, using analytical, logical and evaluative computational thinking, to a wide range of problems.</p> <ul style="list-style-type: none"> • Create an informed and detailed analysis to explicit and implicit meaning of media products and specific elements with a developed understanding of context. • Engage with complex aspects of representation/audience. • Makes reasoned judgements and conclusions looking at both similarities and differences. • Appropriate use of subject specific terminology. 	<p>Produce a working solution that meets almost all requirements of a substantial problem.</p> <ul style="list-style-type: none"> • Recognises that the design of an algorithm is distinct from its expression in a programming language (which will depend on the programming constructs available). • Represents algorithms using structured language. • Understands and applies parameter passing. • Understands the difference between, and uses, both pre-tested e.g. “while” and post-tested e.g. “until” loops. • Applies a modular approach to error detention and correction. • Undertakes creative projects that collect, analyse and evaluate data to meet the needs of a known user group. • Effectively designs and creates digital artefacts for a wider or remote audience. • Documents user feedback, the improvements identified, and the refinements made to the solution. • Considers the properties of media when importing them into digital artefacts.
<p>+ 6 -</p>	<p>Demonstrate detailed and appropriate knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.</p> <ul style="list-style-type: none"> • Understands the von Neumann architecture in relation to the fetch- executive 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, switchers and the names of protocols e.g. SMTP, iMAP, POP, FTP, TCP/IP, associated with networking computer systems. • Uses technologies and online services securely and knows how to identify and report inappropriate conduct. • Identifies and explains how the use of technology can impact on society. 	<p>Appropriately apply fundamental concepts, principles and mathematical skills, using analytical, logical and evaluative computational thinking, to a range of problems.</p> <ul style="list-style-type: none"> • Understands a recursive solution to a problem repeatedly applies the same solution to smaller instances of the problem. • Understands the notion of performance for algorithms and appreciates that some algorithms have different performance characteristics for the same task. • 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. • Distinguishes between data used in a simple program (a variable) and the storage structure for that data. 	<p>Produce a working solution that meets almost all requirements of a substantial problem.</p> <ul style="list-style-type: none"> • Recognises that some problems share the same characteristics and use the same algorithm to solve both. • Uses nested selection statements. • Appreciates the need for, and writes, custom functions including use of parameters. • Knows the different between and uses appropriately procedures and functions. • Understands and uses negation with operators. • Uses and manipulates one-dimensional data structures. • Detects and corrects syntactical errors. • Justifies the choice of and independently combines and uses multiple digital devices, internet services and application software to achieve given goals. • Evaluates the trustworthiness of digital content • Designs criteria for users to evaluate the quality of solutions, uses feedback to identify improvements.



Subject Assessment Grid

<p>+ 5 -</p>	<p>Demonstrate mostly accurate and appropriate knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.</p> <ul style="list-style-type: none"> • Recognises and understands the function of 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 and networks, including the internet i.e. IP addresses and packet switching. • Recognises ethical issues surrounding the application of information technology beyond school. 	<p>Appropriately apply fundamental concepts, principles and mathematical skills, using analytical, logical and evaluative computational thinking, to a range of problems.</p> <ul style="list-style-type: none"> • Understands that iteration is the repetition of a process such as a loop. • Recognises that different algorithms exist for the same problem. • Understands that programming bridges the gap between algorithmic solutions and computers. • 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. 	<p>Produce a working solution that meets most requirements of a substantial problem.</p> <ul style="list-style-type: none"> • Represents solutions using a structured notation. • Can identify similarities and differences in situations and can use these to solve problems (pattern recognition). • 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. • Evaluates the appropriateness of digital devices, internet services and application software to achieve given goals. • Designs criteria to critically evaluate the quality of solutions, uses the criteria to identify improvements and can make appropriate refinements to the solution.
<p>+ 4 -</p>	<p>Demonstrate some knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.</p> <ul style="list-style-type: none"> • 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. • Understands the potential of information technology for collaboration when computers are networked. • Demonstrates responsible use of technologies and online services and knows a range of ways to report concerns. 	<p>Apply fundamental concepts, principles and mathematical skills, using basic analytical and logical computational thinking, to straightforward problems with some accuracy.</p> <ul style="list-style-type: none"> • Recognises that different solutions exist for the same problem. • 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. 	<p>Produce a partially working solution that meets some requirements of a substantial problem.</p> <ul style="list-style-type: none"> • Designs solutions by decomposing a problem and creates a sub-solution for each of these parts. • Understands the difference between, and appropriately uses "if" and "if, then" and "else" statements. • Uses a variable and relational operator within a loop to govern termination. • Designs, writes and debugs modular programs using procedures, knowing that a procedure can be used to hide the detail with sub-solution. • Makes judgements about digital content when evaluating and repurposing it for a given audience. • Recognises the audience when designing and creating digital content. • Uses criteria to evaluate the quality of solutions, can identify improvements making some refinements to the solution, and future solutions.



Subject Assessment Grid

<p>+ 3 -</p>	<p>Demonstrate basic knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.</p> <ul style="list-style-type: none"> • Knows that computers collect data from various input devices, including sensors and application software. • Understands the different between hardware and application software, and their roles within a computer system. • Understands the different 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 • Recognises what is acceptable and unacceptable behaviour when using technologies and online services. 	<p>Apply fundamental concepts, principles and mathematical skills, using basic analytical and logical computational thinking, to straightforward problems with basic accuracy.</p> <ul style="list-style-type: none"> • Uses logical reasoning to predict outputs, showing an awareness of inputs. • Understands the different 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. 	<p>Produce a partially working solution that meets some requirements of a substantial problem.</p> <ul style="list-style-type: none"> • Designs solutions (algorithms) that use repetition and two-way selection i.e. “if”, “then” and “else”. • Uses diagrams to express solutions. • 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. • Collects, organises and presents data and information in digital content. • Creates digital content to achieve a given goal through combining software packages and internet services to communicate with a wider audience e.g. blogging. • Makes appropriate improvements to solutions based on feedback received and can comment on the success of the solution.
<p>+ 2 -</p>	<p>Demonstrate limited knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.</p> <ul style="list-style-type: none"> • 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. • Shares their experiences of technology in school and beyond the classroom. 	<p>Apply fundamental concepts, principles and mathematical skills, using basic analytical and logical computational thinking, to straightforward problems with limited accuracy.</p> <ul style="list-style-type: none"> • Understands that algorithms are implemented on digital devices as programs. • Uses logical reasoning to predict outcomes. • 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. 	<p>Produce a partially working solution that meets some requirements of a substantial problem.</p> <ul style="list-style-type: none"> • Designs simple algorithms and programs using loops, arithmetic and selection i.e. “if” statements. • Detects and corrects errors i.e. debugging in algorithms. • Uses logical reasoning to predict the behaviour of programs. • Detects and corrects simple semantic errors i.e. debugging in programs • Uses technology with increasing independence to purposefully organise digital content. • Shows an awareness for the quality of digital content collected. • Uses a variety of software to manipulate and present digital content: data and information • Talks about their work and makes improvements to solutions based on feedback received.



Subject Assessment Grid

<p>+ 1 -</p>	<p>Demonstrate limited knowledge and understanding of fundamental concepts and principles including digital systems and societal impacts.</p> <ul style="list-style-type: none"> • 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, and the need for keeping personal information private. • Knows what to do when concerned about content or being contacted. • Understands that people interact with computers. • Shares their use of technology in school. • Knows common uses of information technology beyond the classroom. 	<p>Apply fundamental concepts, principles and mathematical skills, using basic analytical and logical computational thinking, to straightforward problems with limited accuracy.</p> <ul style="list-style-type: none"> • Understands what an algorithm is and is able to express simple linear algorithms symbolically. • Understands that computers need 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. 	<p>Produce a partially working solution that meets few requirements of a substantial problem.</p> <ul style="list-style-type: none"> • Demonstrates care and precision to avoid errors. • 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 e.g. programmable robots etc. • Executes, checks and changes programs. • Understands that programs execute by following precise instructions. • Uses software under the control of the teacher to create, store and edit digital content using appropriate file and folder names. • Talks about their work and makes changes to improve it.
<p>+ WT -</p>	<p>The student is currently working towards a grade in this skill.</p>	<p>The student is currently working towards a grade in this skill.</p>	<p>The student is currently working towards a grade in this skill.</p>