



The British School

| | Year 10 | Year 11 |
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| Term 1 | <u>Data representation</u> | <u>Algorithm design, problem-solving and programming</u> |
| Topic and Content | <p>Number systems</p> <ul style="list-style-type: none"> • how and why computers use binary to represent data • the denary, binary and hexadecimal number systems • converting numbers between denary, binary and hexadecimal • how and why hexadecimal is used for data representation • how to add two positive 8-bit numbers • overflow when performing binary addition • logical binary shifts on positive 8-bit integers • two's complement notation to represent positive and negative binary numbers | <p>The stages in the program development cycle:</p> <ul style="list-style-type: none"> • analysis • design • coding • testing <p>Computer systems and subsystems</p> <p>Problem decomposition into component parts</p> <p>Methods used to design and construct solutions to problems</p> <p>The purpose of an algorithm and the processes involved in it</p> <p>standard methods of solution:</p> <ul style="list-style-type: none"> • linear search • bubble sort |

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| | <p>Text, sound and images</p> <ul style="list-style-type: none">• how and why a computer represents text• the use of character sets including ASCII and Unicode• how and why a computer represents sound• sound sample rate and sample resolution• how and why a computer represents an image• the effects of the resolution and colour depth on images <p>Data storage and compression</p> <ul style="list-style-type: none">• how data storage is measured• calculating the file size of an image and sound file• the purpose of and need for data compression• lossy and lossless compression | <ul style="list-style-type: none">• totalling• counting• finding average, maximum, minimum <p>Validation checks when data is input</p> <p>Verification checks when data is input</p> <p>Use of different types of test data including:</p> <ul style="list-style-type: none">• documentation of a dry run using a trace table <p>Writing, amending, identifying, and correcting errors in:</p> <ul style="list-style-type: none">• flowcharts• programs• Pseudocode. <p>Programming concepts:</p> <ul style="list-style-type: none">• use of variables and constants• input and output• sequence• selection including nesting• iteration• totalling and counting• string handling• operators – arithmetic, logical and Boolean• procedures and functions including the use of:<ul style="list-style-type: none">• parameters• local and global variables• library routines• creating a maintainable program |
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| | | <p>Arrays: including one- and two-dimensional arrays, use of indexes, use of iteration for reading from and writing to arrays</p> <p>File handling: including opening, closing, reading from and writing to data and text files.</p> |
| Skills | <p>Understand how and why computers use binary to represent all forms of data</p> <p>Understand the denary, binary and hexadecimal number systems</p> <p>Convert between</p> <ul style="list-style-type: none"> ● positive denary and positive binary ● positive denary and positive hexadecimal ● positive hexadecimal and positive binary <p>Understand how and why hexadecimal is used as a beneficial method of data representation</p> <ul style="list-style-type: none"> ● Add two positive 8-bit binary integers ● Understand the concept of overflow and why it occurs in binary addition <p>Perform a logical binary shift on a positive 8-bit binary integer and understand the effect this has on the positive binary integer</p> <p>Use two's complement to represent positive and negative 8-bit binary integers</p> <p>Understand how and why a computer represents text and the use of character sets, including American standard code for information interchange (ASCII) and</p> | <p>Understand the program development life cycle, limited to: analysis, design, coding and testing</p> <p>Understand that every computer system is made up of subsystems, which are made up of further sub-systems</p> <p>Understand how a problem can be decomposed into its component parts</p> <p>Use different methods to design and construct a solution to a problem</p> <p>Explain the purpose of a given algorithm</p> <p>Understand standard methods of solution</p> <p>Understand the need for validation checks to be made on input data and the different types of validation check</p> <p>Understand the need for verification checks to be made on input data and the different types of verification check</p> <p>Suggest and apply suitable test data</p> <p>Complete a trace table to document a dry-run of an algorithm</p> <p>Identify errors in given algorithms and suggest ways of correcting these errors</p> |

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| | <p>Unicode</p> <p>Understand how and why a computer represents sound, including the effects of the sample rate and sample resolution</p> <p>Understand how and why a computer represents an image, including the effects of the resolution and colour depth</p> <p>Understand how data storage is measured</p> <p>Calculate the file size of an image file and a sound file, using information given</p> <p>Understand the purpose of and need for data Compression</p> <p>Understand how files are compressed using lossy and lossless compression methods</p> | <p>Write and amend algorithms for given problems or scenarios, using: pseudocode, program code and flowcharts</p> <p>Declare and use variables and constants</p> <p>Understand and use the basic data types</p> <p>Understand and use input and output</p> <p>Understand and use the concept of sequence</p> <p>Understand and use the concept of selection</p> <p>Understand and use the concept of iteration</p> <p>Understand and use the concepts of totalling and counting</p> <p>Understand and use the concept of string handling</p> <p>Understand and use arithmetic, logical and Boolean operators</p> <p>Understand and use nested statements</p> <p>Understand what is meant by procedures, functions and parameters</p> <p>Define and use procedures and functions, with or without parameters</p> <p>Understand and use local and global variables</p> <p>Understand and use library routines</p> <p>Understand how to create a maintainable program</p> <p>Declare and use one-dimensional (1D) and two-dimensional (2D) arrays</p> |
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| | | <p>Understand the use of arrays</p> <p>Write values into and read values from an array using iteration</p> <p>Understand the purpose of storing data in a file to be used by a program</p> <p>Open, close and use a file for reading and writing</p> |
| Methods of Assessment | <p>March 2019 Paper 12, question 3(a)</p> <p>June 2019 Paper 11, question 1</p> <p>June 2019 Paper 13, question 1(a)</p> <p>Nov 2019 Paper 11, question 2</p> <p>Nov 2019 Paper 12, question 4</p> <p>Nov 2019 Paper 13, question 1(c)(i)</p> <p>March 2020 Paper 12, question 5</p> <p>June 2020 Paper 11, question 9(d)</p> <p>June 2020 Paper 12, question 7</p> <p>June 2020 Paper 13, question 1</p> <p>2023 Specimen Paper 1, question 1</p> <p>March 2019 Paper 12, question 1</p> <p>June 2019 Paper 12, question 4(b)</p> <p>Nov 2019 Paper 11, question 6(d)</p> <p>Nov 2019 Paper 12, question 5(a) and 5(b)</p> <p>Nov 2019 Paper 13, question 1(c)(ii)</p> <p>March 2020 Paper 12, question 3(d)</p> <p>June 2020 Paper 11, question 3(c)</p> | <p>March 2019 Paper 22, question 2, question 3 and question 5</p> <p>June 2019 Paper 21, question 4</p> <p>June 2019 Paper 22, question 2, question 3 and question 5</p> <p>June 2019 Paper 23, question 2, question 3 and question 4</p> <p>Nov 2019 Paper 21, question 1(e), question 2 and question 4</p> <p>Nov 2019 Paper 22, question 2, question 3 and question 4</p> <p>Nov 2019 Paper 23, question 5 and question 6</p> <p>March 2020 Paper 22 question 2, question 3 and question 4</p> <p>June 2020 Paper 21, question 2, question 3, question 4 and question 5</p> <p>June 2020 Paper 22, question 1(b), question 3 and question 4</p> <p>June 2020 Paper 23, question 3, question 4, question 5 and question 6</p> <p>2023 Specimen Paper 2, question 2, question 4, question 5 and question 7</p> |
| Term 2 | <u>Data transmission</u> | <u>Databases & Boolean Logic</u> |
| Topic and Content | <p>Types and methods of data transmission</p> <ul style="list-style-type: none"> • how data is broken up into data packets before transmission • the structure of data packets (header, payload | <p>The design and use of single table databases</p> <ul style="list-style-type: none"> • fields • records • validation |

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| | <p>and trailer)</p> <ul style="list-style-type: none"> ● packet switching (including the role of the router in the process) ● methods of data transmission (serial, parallel, simplex, half-duplex and full-duplex) ● the Universal Serial Bus (USB) <p>Methods of error detection</p> <ul style="list-style-type: none"> ● why error checking methods are needed ● error checking methods following data transmission: parity checks,Checksum, echo check ● use of check digits to detect data entry errors ● use of automatic repeat requests (ARQs) to detect errors <p>Encryption</p> <ul style="list-style-type: none"> ● the need for and the purpose of encryption ● symmetric and asymmetric encryption ● use of public and private keys. | <p>The use of basic data types</p> <ul style="list-style-type: none"> ● text/alphanumeric ● character ● Boolean ● integer ● real ● date/time <p>The identification, purpose and use of primary keys</p> <p>SQL scripts, used to query data stored in a single table database</p> <p>The identification, definition, symbols and functions of the standard logic gates: NOT, AND, OR, NAND, NOR and XOR</p> <p>How to use logic gates to create logic circuits from:</p> <ul style="list-style-type: none"> ● a given problem ● a logic expression ● a truth table <p>How to complete truth tables from:</p> <ul style="list-style-type: none"> ● a given problem ● a logic expression ● a logic circuit <p>How to write a logic expression from:</p> <ul style="list-style-type: none"> ● a given problem ● a logic circuit ● a truth table. |
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| <p>Skills</p> | <p>Understand that data is broken down into packets to be transmitted</p> <p>Describe the structure of a packet</p> <p>Describe the process of packet switching</p> <p>Describe how data is transmitted from one device to another using different methods of data transmission</p> <p>Explain the suitability of each method of data transmission, for a given scenario</p> <p>Understand the universal serial bus (USB) interface and explain how it is used to transmit data</p> <p>Understand the need to check for errors after data transmission and how these errors can occur</p> <p>Describe the processes involved in each of the following error detection methods for detecting errors in data after transmission: parity check (odd and even), checksum and echo check</p> <p>Describe how a check digit is used to detect errors in data entry and identify examples of when a check digit is used, including international standard book numbers (ISBN) and barcodes</p> <p>Describe how an automatic repeat query (ARQ) can be used to establish that data is received without error</p> <p>Understand the need for and purpose of encryption when transmitting data</p> | <p>Define a single-table database from given data storage requirements</p> <p>Suggest suitable basic data types</p> <p>Understand the purpose of a primary key and identify a suitable primary key for a given database table</p> <p>Read, understand and complete structured query language (SQL) scripts to query data stored in a single database table</p> <p>Identify and use the standard symbols for logic gates</p> <p>Define and understand the functions of the logic gates</p> <p>Use logic gates to create given logic circuits from a:</p> <ul style="list-style-type: none"> ● problem statement ● logic expression ● truth table <p>Complete a truth table from a:</p> <ul style="list-style-type: none"> ● problem statement ● logic expression ● logic circuit <p>Write a logic expression from a:</p> <ul style="list-style-type: none"> ● problem statement ● logic circuit ● truth table |
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| | Understand how data is encrypted using symmetric and asymmetric encryption | |
| Methods of Assessment | <p>March 2019 Paper 12, question 4(d) and question 6(a) June 2019 Paper 12, question 9 June 2019 Paper 13, question 3(b) and question 5 Nov 2019 Paper 11, question 5 Nov 2019 Paper 12, question 5(c)(ii), question 9 and question 10(a) Nov 2019 Paper 13, question 1(b) question 3 and question 5 March 2020 Paper 12, question 2 June 2020 Paper 11, question 3(a), 3(b) and question 4 June 2020 Paper 12, question 3 June 2020 Paper 13, question 9 2023 Specimen Paper 1, question 2(a), 2(b) and question 9</p> | |
| Term 3 | <u>Hardware</u> | <u>The internet and its uses & Automated and emerging technologies</u> |
| Topic and Content | <p>Computer architecture</p> <ul style="list-style-type: none"> ● the Central Processing Unit (CPU)/microprocessor ● von Neumann architecture ● arithmetic and logic unit (ALU), control unit (CU) and registers ● control bus, address bus, data bus ● cores, cache and the internal clock ● Fetch–Decode–Execute cycle ● instruction set for a CPU ● embedded systems <p>Input and output devices</p> <ul style="list-style-type: none"> ● the following input devices: barcode and QR | <p>The internet and the World Wide Web</p> <ul style="list-style-type: none"> ● the differences between the internet and the World Wide Web ● what is meant by a uniform resource locator (URL) ● the purpose and operation of hypertext transfer protocols (HTTP and HTTPS) ● the purpose and function of a web browser ● how web pages are located, retrieved and displayed ● cookies (including session and persistent cookies) <p>Digital currency</p> <ul style="list-style-type: none"> ● digital currencies and how they are used ● the process of blockchaining and how it is used to track digital currency transactions |

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| | <p>code scanners, digital cameras, keyboards, microphones, mouse, 2D/3D scanners and touch screens</p> <ul style="list-style-type: none"> the following output devices: actuators, light projectors, inkjet and laser printers, LED and LCD screens, speakers and 3D printers sensors and their use in control and monitoring <p>Data storage</p> <ul style="list-style-type: none"> primary storage (RAM and ROM) – secondary storage (magnetic, optical and solid state) virtual memories cloud storage <p>Network hardware</p> <ul style="list-style-type: none"> network systems (NIC, MAC address, IP address and routers). | <p>Cyber security</p> <ul style="list-style-type: none"> cyber security threats solutions to keep data safe from security threats <p>Automated systems</p> <ul style="list-style-type: none"> the use of sensors, microprocessors and actuators in automated systems the advantages and disadvantages of using automated systems in given scenarios <p>Robotics</p> <ul style="list-style-type: none"> what is meant by robotics the characteristics of a robot the roles, advantages and disadvantages of robots <p>Artificial intelligence</p> <ul style="list-style-type: none"> what is meant by artificial intelligence (AI) the main characteristics of AI the basic operation and components of AI systems to simulate intelligent behaviour. |
| <p>Skills</p> | <p>Understand the role of the central processing unit (CPU) in a computer</p> <p>Understand what is meant by a microprocessor</p> <p>Understand the purpose of the components in a CPU, in a computer that has a Von Neumann architecture</p> <p>Describe the process of the fetch–decode–execute</p> | <p>Understand the difference between the internet and the world wide web</p> <p>Understand what is meant by a uniform resource locator (URL)</p> <p>Describe the purpose and operation of hypertext transfer protocol (HTTP) and hypertext transfer protocol secure (HTTPS)</p> <p>Explain the purpose and functions of a web browser</p> |

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| | <p>cycle including the role of each component in the process</p> <p>Understand what is meant by a core, cache and clock in a CPU and explain how they can affect the performance of a CPU</p> <p>Understand the purpose and use of an instruction set for a CPU</p> <p>Describe the purpose and characteristics of an embedded system and identify devices in which they are commonly used</p> <p>Understand what is meant by an input device and why it is required</p> <p>Understand what is meant by an output device and why it is required</p> <p>Understand what is meant by a sensor and the purposes of sensors</p> <p>Identify the type of data captured by each sensor and understand when each sensor would be used, including selecting the most suitable sensor for a given context</p> <p>Understand what is meant by primary storage</p> <p>Understand what is meant by secondary storage</p> <p>Describe the operation of magnetic, optical and solid-state (flash memory) storage and give examples</p> | <p>Describe how web pages are located, retrieved and displayed on a device when a user enters a URL</p> <p>Explain what is meant by cookies and how they are used, including session cookies and persistent cookies</p> <p>Understand the concept of a digital currency and how digital currencies are used</p> <p>Understand the process of blockchain and how it is used to track digital currency transactions</p> <p>Describe the processes involved in, and the aim of carrying out, a range of cyber security threats</p> <p>Explain how a range of solutions are used to help keep data safe from security threats</p> <p>Describe how sensors, microprocessors and actuators can be used in collaboration to create automated systems</p> <p>Describe the advantages and disadvantages of an automated system used for a given scenario</p> <p>Understand what is meant by robotics</p> <p>Describe the characteristics of a robot</p> <p>Understand the roles that robots can perform and describe the advantages and disadvantages of their use</p> <p>Understand what is meant by artificial intelligence (AI)</p> <p>Describe the main characteristics of AI as the collection of data and the</p> |
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| | <p>of each</p> <p>Describe what is meant by virtual memory, how it is created and used and why it is necessary</p> <p>Understand what is meant by cloud storage</p> <p>Explain the advantages and disadvantages of storing data on the cloud in comparison to storing it locally</p> <p>Understand that a computer needs a network interface card (NIC) to access a network</p> <p>Understand what is meant by and the purpose of a media access control (MAC) address, including its structure</p> <p>Understand what is meant by and the purpose of an internet protocol (IP) address</p> <p>Understand that there are different types of IP address</p> <p>Describe the role of a router in a network</p> | <p>rules for using that data, the ability to reason, and can include the ability to learn and adapt</p> <p>Explain the basic operation and components of AI systems to simulate intelligent behaviour</p> |
| <p>Methods of Assessment</p> | <p>June 2019 Paper 13, question 2(b)</p> <p>Nov 2019 Paper 11, question 8</p> <p>Nov 2019 Paper 12, question 2</p> <p>Nov 2019 Paper 13, question 7(a)</p> <p>March 2020 Paper 12, question 1</p> <p>June 2020 Paper 11, question 5</p> <p>June 2020 Paper 12, question 1</p> <p>June 2020 Paper 13, question 5(b)(ii)</p> <p>2023 Specimen Paper 1, question 4</p> <p>March 2019 Paper 12, question 3(b), and question 6</p> <p>June 2019 Paper 11, question 3 and question 6(b)</p> | <p>March 2019 Paper 12, question 7</p> <p>June 2019 Paper 11, question 4 and question 6(a)</p> <p>June 2019 Paper 12, question 5, question 6(a), 6(b), 6(d) and 6(e)</p> <p>June 2019 Paper 13, question 1(d), 1(e) and question 3</p> <p>Nov 2019 Paper 11, question 3 and question 6(b)</p> <p>Nov 2019 Paper 12, question 7 and question 10</p> <p>Nov 2019 Paper 13, question 8</p> <p>March 2020 Paper 12, question 8</p> <p>June 2020 Paper 11, question 1(e), question 7 and question 9(b)</p> <p>June 2020 Paper 12, question 5 and question 10</p> <p>June 2020 Paper 13, question 3, question 7 and question 10</p> |

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| | <p>June 2019 Paper 12, question 4, question 7(b) and question 10</p> <p>June 2019 Paper 13, question 6</p> <p>Nov 2019 Paper 11, question 1 and question 4</p> <p>Nov 2019 Paper 12, question 6, question 7(a) and question 11</p> <p>Nov 2019 Paper 13, question 1(a) and 1(d)</p> <p>March 2020 Paper 12, question 3(a), 3(b) and 3(c)</p> <p>June 2020 Paper 11, question 1(a), 1(b), 1(d) question 6 and question 8</p> <p>June 2020 Paper 12, question 6, question 8(b) and question 9</p> <p>June 2020 Paper 13, question 2, question 5(b)(i) and question 8</p> <p>June 2019 Paper 13, question 2(a)</p> <p>June 2020 Paper 11, question 1(c)</p> <p>2023 Specimen Paper 1, question 1(b), question 2 and question 3(a)</p> | <p>2023 Specimen Paper 1, question 2(c) and question 10</p> <p>March 2019 Paper 12, question 3(b)</p> <p>June 2019 Paper 12, question 7(a)</p> <p>Nov 2019 Paper 11, question 2</p> <p>Nov 2019 Paper 12, question 4</p> <p>Nov 2019 Paper 13, question 6</p> <p>March 2020 Paper 12, question 7</p> <p>June 2020 Paper 11, question 6</p> <p>2023 Specimen Paper 1 Question 6</p> |
| Term 4 | <u>Software</u> | <u>Revision Time</u> |
| Topic and Content | <p>Types of software and interrupts</p> <ul style="list-style-type: none"> the differences between systems software and applications software (including the operating system, utility programs and application software) the role and basic functions of an operating system the need for hardware, firmware and operating systems when running application software role and operation of interrupts <p>Types of programming language, translators and IDEs</p> <ul style="list-style-type: none"> advantages and disadvantages of high-level | |

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| | <p>and low-level languages</p> <ul style="list-style-type: none">• assembly language is a low-level language that uses mnemonics and assemblers• the operation of compilers and interpreters for high-level languages• advantages and disadvantages of compilers and interpreters• the role and functions of integrated development environment (IDEs) when writing code. | |
| Skills | <p>Describe the difference between system software and application software and provide examples of each.</p> <p>Describe the role and basic functions of an operating system.</p> <p>Understand how hardware, firmware and an operating system are required to run applications software.</p> <p>Describe the role and operation of interrupts.</p> <p>Explain what is meant by a high-level language, and low-level language, including the advantages and disadvantages of each.</p> <p>Understand that assembly language is a form of low-level language that uses mnemonics, and that an assembler is needed to translate an assembly language program into machine code.</p> <p>Describe the operation of a compiler and an interpreter, including how a high-level language is translated by each and how errors are reported.</p> | |

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| | <p>Explain the advantages and disadvantages of a compiler and an interpreter.</p> <p>Explain the role of an IDE and the common functions it provides.</p> | |
| <p>Methods of Assessment</p> | <p>March 2019 Paper 12, question 4(a) and 4(b) June 2019 Paper 11, question 7 Nov 2019 Paper 11, question 6(a) Nov 2019 Paper 12, question 7(a) Nov 2019 Paper 13, question 2 and question 7(b) March 2020 Paper 12, question 4 June 2020 Paper 11, question 8(a), question 9(a), 9(b) and 9(c) June 2020 Paper 12, question 2 and question 8(c) June 2020 Paper 13 2023 Specimen Paper 1, question 4(d) and question 5</p> | |