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What will we be learning?

Unit 01: Computational Thinking

Why this? Why now?

Students learn how to go about solving problems and the processes that are taken to draw up algorithms. These should be learnt as a design process towards programming as it makes the next stages of solving problems more efficient. This section links well with 06 Programming, where students will explore programming in Python; this unit enhances a student's ability to develop and trace algorithms when programming.

Key Words:

- ☐ Abstraction
- ☐ Algorithm
- ☐ Computational thinking
- ☐ Decomposition
- ☐ Divide and conquer
- ☐ Flowchart
- ☐ Logic error
- ☐ Logic gate
- ☐ Runtime error
- ☐ Syntax error
- ☐ Trace table
- ☐ Truth table
- ☐ Validation

What will we learn?

"Students are expected to develop a set of computational thinking skills that enable them to design, implement and analyse algorithms for solving problems. Students are expected to be familiar with and use the Programming Language Subset (PLS)."

- 1.1 Decomposition and abstraction
- 1.2 Algorithms
- 1.3 Truth tables

What opportunities are there for wider study?

Students will be able to look at problems in the future and understand approaches to take to solve the problems. These may not be specific to Computer Science, so it opens up many different opportunities in the future. Students are then also able to apply algorithms in 06 Programming when creating a program, including those outside the scope of the lessons. Many lessons of this section can be completed in groups, which gives good teamwork opportunities to prepare them for the future.

There are not only additional searching and sorting algorithms that can be studied, but further logic gates that can be explored in a student's own time.

How will I be assessed?

End of Unit Test (written): 50 minute summative assessment, consisting of exam-style questions.

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What will we be learning?

Unit 02: Data

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Why this? Why now?

This unit is the building block for students going forwards. The skillset within data representation appears appears within 04 Networks when performing other calculations and puts strorage capacities into context in 03 Computers. Without understanding the core elements of this unit, some further concepts are limited.

What will we learn?

"Computers use binary to represent different types of data. Students are expected to learn how different types of data are represented in a computer."

- 2.1 Binary
- 2.2 Data representation
- 2.3 Data storage and compression

What opportunities are there for wider study?

Key Stage 3 develops the basic understanding and this course builds on this, with the inclusion of binary addition, hexadcimal and compression.

In further study students also explore binary subtraction, how decimal numbers are stored, binary multiplication and how significantly large (millions or higher) and small numbers are stored in a more efficient manner. Additionally, the theory of image and sound files can be explored in greater depth.

How will I be assessed?

End of Unit Test (written): 50 minute summative assessment, consisting of exam-style questions.

Key Words:

- ☐ Amplitude
- ☐ Analogue
- ☐ Analogue to digital conversion (ADC)
- ☐ Arithmetic shift
- ☐ ASCII
- ☐ Binary
- ☐ Binary shift
- ☐ Bit
- ☐ Bit depth
- ☐ Bitmap
- ☐ Byte
- ☐ Colour depth
- ☐ Compression
- ☐ Gibibyte (GiB)
- ☐ Gigabyte (GB)
- ☐ Hexadecimal
- ☐ Kibibyte (KiB)
- ☐ Kilobyte (KB)
- ☐ Least significant bit (LSB)
- ☐ Logical shift
- ☐ Lossy/lossless compression
- ☐ Mebibyte (MiB)
- ☐ Megabyte (MB)
- ☐ Most significant bit (MSB)
- ☐ Nibble
- ☐ Overflow error
- ☐ Pixel
- ☐ Sampling
- ☐ Sampling interval
- ☐ Sampling points
- ☐ Sampling rate
- ☐ Tebibyte (TiB)
- ☐ Terabyte (TB)
- ☐ Two's complement
- ☐ Unsigned number

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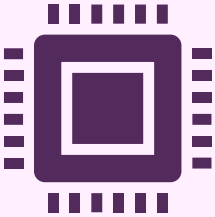
What will we be learning?

Unit 03: Computers



Why this? Why now?

Computer architecture has already been studied in Year 7, and the curiosity of students to learn how computers work makes this an ideal second unit of study. Students are using computers on a daily basis, so an understanding of how they work puts real-life into practice. The previous unit of 02 Data is referenced when dealing with storage capacities, and file and bus sizes.

What will we learn?

"Students must be familiar with the hardware and software components that make up a computer system."

- 3.1 Hardware
- 3.2 Software
- 3.3 Programming languages

What opportunities are there for wider study?

A lot of these concepts can be explored further to an A Level standard, where the architecture of a computer can be studied in greater depth. Students may wish to learn Assembly Language to become more familiar with the mnemonics an process.

The Little Man Computer can be used: https://peterhigginson.co.uk/lmc

How will I be assessed?

End of Unit Test (written): 50 minute summative assessment, consisting of exam-style questions.

Key Words:

- ☐ Accumulator
- ☐ Actuator
- ☐ Address/data/control bus
- ☐ Application software
- ☐ Arithmetic logic unit (ALU)
- ☐ Arithmetic operator
- ☐ Assembly language
- ☐ Audit trail
- ☐ Bidirectional/unidirectional
- ☐ Bluetooth
- ☐ Bus width
- ☐ Central processing unit (CPU)
- ☐ Clock
- ☐ Code review
- ☐ Compiler
- ☐ Computer architecture
- ☐ Concurrent processing
- ☐ Control unit (CU)
- ☐ Data capacity
- ☐ Device driver
- ☐ Disk defragmenter
- ☐ Embedded system
- ☐ Fetch-decode-execute cycle
- ☐ File repair
- ☐ Flash memory
- ☐ Fragmented
- ☐ Graphical user interface (GUI)
- ☐ Hardware/software
- ☐ High-level/low-level language
- ☐ Incremental backup
- ☐ Instruction register
- ☐ Instruction set
- ☐ Interpreter
- ☐ Library
- ☐ Machine code
- ☐ Machine dependent
- ☐ Magnetic storage
- ☐ Main memory
- ☐ Memory address
- ☐ Microcontroller
- ☐ Mnemonic
- ☐ Multitasking
- ☐ Object code
- ☐ Operating system
- ☐ Optical storage
- ☐ Peripheral device
- ☐ Program code
- ☐ Random-access memory (RAM)
- ☐ Register
- ☐ Secondary storage
- ☐ Sector
- ☐ Solid-state storage
- ☐ Stored program concept
- ☐ Translator
- ☐ User interface
- ☐ Utility software
- ☐ Version control
- ☐ Virtual memory
- ☐ Volatile/non-volatile

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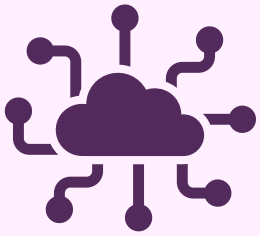
What will we be learning?

Unit 04: Networks



Why this? Why now?

In Year 9, students had most recently visited the 09 Internet unit, and therefore have recent knowledge related to many of the technically demanding elements of this unit. Due to the size of the unit and its links to other parts of the course, it is the last one students study as part of the GCSE.

What will we learn?

"Most computer applications in use today would not be possible without networks. Students should understand the key principles behind the organisation of computer networks."

- 4.1 Networks
- 4.2 Network security

What opportunities are there for wider study?

Many of the concepts studies can be explored in greater detail. This unit only 'scratches the surface' of networking theory, which gives students the opportunity to delve into A Level communication and internet concepts.

Students should also be able to apply this knowledge to a home network setup, and educate others on security threat detection and prevention.

How will I be assessed?

End of Unit Test (written): 50 minute summative assessment, consisting of exam-style questions.

Key Words:

- ☐ Acceptable use policy
- ☐ Access control
- ☐ Anti-malware
- ☐ Asymmetric encryption
- ☐ Authentication
- ☐ Bandwidth
- ☐ Bluetooth
- ☐ Broadband
- ☐ Brute force
- ☐ Checksum
- ☐ Cyberattack
- ☐ Cybersecurity
- ☐ Data packet
- ☐ Data transfer rate
- ☐ Decryption key
- ☐ Denial of service
- ☐ Domain name system (DNS)
- ☐ Dynamic IP address
- ☐ Encryption
- ☐ End-to-end security
- ☐ Ethical hacking
- ☐ Fibre-optic cable
- ☐ Firewall
- ☐ Hacker
- ☐ Internet backbone
- ☐ Internet protocol (IP)
- ☐ Internet service provider (ISP)
- ☐ IP address
- ☐ Latency
- ☐ Local area network (LAN)
- ☐ Malware
- ☐ Mesh network
- ☐ Near field communication (NFC)
- ☐ Network Access Point (NAP)
- ☐ Network manager
- ☐ Node
- ☐ Packet switching
- ☐ Peer-to-peer (P2P)
- ☐ Penetration testing
- ☐ Phishing
- ☐ Physical security
- ☐ Radio-frequency identification (RFID)
- ☐ Router
- ☐ Routing table
- ☐ Social engineering
- ☐ Static IP address
- ☐ Switch
- ☐ Symmetric encryption
- ☐ TCP/IP
- ☐ Topologies
- ☐ Transmission media
- ☐ Twisted pair
- ☐ Unpatched software
- ☐ Wi-Fi
- ☐ Wide area network (WAN)
- ☐ Wireless access point (WAP)

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What will we be learning?

Unit 05: Issues and Impact

Why this? Why now?

Students have more time to develop their understanding of Computer Science in the wider world. This means that, when discussing elements within this unit, there are more opportunities for students to see links themselves. As the penultimate theoretical unit that is taught, time will be spent in lessons developing student responses to 6-mark questions. Longer form responses are typical of this unit, and is a skill that is developed later on in the course.

What will we learn?

"Students should be aware of the influence of digital technology and recognise some of the issues and the impact on wider society associated with its use."

- 5.1 Environmental
- 5.2 Ethical and legal
- 5.3 Cybersecurity

What opportunities are there for wider study?

Further research, formally and informally, can be undertaken with different computer related news articles. Students can also make use of YouTube as an educational resource here, as these often have information in a more creative form.

For example: The Age of AI (YouTube Original) presented by Robert Downey jr

Students can really extend their knowledge, well beyond the scope of the GCSE curriculum, in anticipation of the A Level specification. This is addressed as an area of focus, but does not have its own unit as it does here.

How will I be assessed?

End of Unit Test (written): 30 minute summative assessment, consisting of exam-style questions.

Key Words:

- ☐ Algorithm bias
- ☐ Artificial intelligence (AI)
- ☐ Carbon footprint
- ☐ Copyright
- ☐ Data breach
- ☐ Data integrity
- ☐ E-waste
- ☐ Identity theft
- ☐ Intellectual property
- ☐ Lawful
- ☐ Machine learning
- ☐ Patent
- ☐ Pattern recognition
- ☐ Personal data
- ☐ Power harvesting
- ☐ Precious metals
- ☐ Predictive policing
- ☐ Replacement cycle
- ☐ Robot
- ☐ Software licence
- ☐ Trademark

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What will we be learning?

Unit 06: Programming

Why this? Why now?

Students begin to look at Python programming at the start of the course, as further down the line, they start looking at more complex languages. Starting with a simpler language eases them nicely into looking at other languages later in their educational journey. lot of exploration for these concepts will be extremely useful for the students.

With a basic understanding of simple programming concepts in the first term, students are better prepared for 01 Computational Thinking, where the algorithms studied can be programmed; this further enhances their learning.

What will we learn?

"Mastering programming involves much more than simply learning the syntax/semantics of a programming language. It also involves learning strategies for problem solving, embracing mistakes as opportunities to learn, mastering a few simple tools and working together with others to achieve goals.

All problems set in the practical tasks in the examination can be solved with the functionalities presented in the Programming Language Subset (PLS) document."

- 6.1 Develop code
- 6.2 Constructs
- 6.3 Data types and structures
- 6.4 Input/ouput
- 6.5 Operators
- 6.6 Subprograms

What opportunities are there for wider study?

Programming opens many opportunities for large tech companies in the future. As programming environments can be accessed anywhere at any time, students can look at developing their own programming projects beyond the scope of the lessons.

Some students may also choose to learn an additional programming language in their own time; this prepares them well for the challenges of the A Level course.

How will I be assessed?

End of Unit Test (on-screen): 45 minute summative assessment, consisting of exam-style questions.

Key Words:

- ☐ Constants
- ☐ Global/local Variables
- ☐ Assignment
- ☐ Sequence
- ☐ Selection
- ☐ Repetition
- ☐ Iteration
- ☐ Data structures
- ☐ Subprograms
- ☐ Parameters
- ☐ Input/output
- ☐ Count-controlled
- ☐ Condition-controlled
- ☐ Integer
- ☐ Real
- ☐ Boolean
- ☐ Char
- ☐ 1D/2D array
- ☐ String
- ☐ Record
- ☐ Length
- ☐ Position
- ☐ Case conversion
- ☐ CSV files
- ☐ Length check
- ☐ Presence check
- ☐ Range check
- ☐ Pattern check
- ☐ Arithmetic operators
- ☐ Modulus
- ☐ Integer division
- ☐ Exponentiation
- ☐ Relational operators
- ☐ Logical operators
- ☐ Libraries
- ☐ Parameters
- ☐ Return