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What will we be learning?

Section 01 – Computer Systems

Why this? Why now?

An initial introduction to this basic understanding of the parts of the computer system, along with the introduction to Binary (Section 02) provides a core understanding that the remainder of the course will be built upon. This also allows students to really get to grips with the step up into KS4 computing, as it demonstrates how the Computer Components unit is core in initially developing the understanding to be built upon later in their school education.

What will we learn?

This initial introduction to the components of a computer system develops student understanding of the basic processes that are occuring inside of acomputer system each and every second. Students will explore Systems Architecture, through investigating the Fetch Decode and Execute cycle and Von Neumann designs, as well as the impacts on CPU performance, definitions and uses of embedded systems, the need for Primary Memory (RAM/ROM) and why computers need to also include Secondary Storage (HDD / SSD).

What opportunities are there for wider study?

Building up knowledge and resources from KS3 computing in order to better understand the computer systems surrounding us. Students will use this knowledge when investigating further units, such as Section 04 Security and within their programming tasks in Section 08.

How will I be assessed?

End of Unit Forms MCQ

Key Words:

- ☐ Accumulator
- ☐ Arithmetic Logic Unit
- ☐ Control Unit
- ☐ CPU
- ☐ Decode
- ☐ Execute
- ☐ Fetch
- ☐ Input/output
- ☐ Instruction
- ☐ Processor
- ☐ Registers
- ☐ Storage
- ☐ ALU (Arithmetic Logic Unit)
- ☐ Buses
- ☐ Cache
- ☐ CU (Control Unit)
- ☐ MAR (Memory Address Register)
- ☐ MDR (Memory Data Register)
- ☐ Program Counter
- ☐ Von Neumann architecture
- ☐ Clock speed
- ☐ Core
- ☐ Digital device
- ☐ Embedded system
- ☐ Function
- ☐ Microprocessor
- ☐ RAM / ROM
- ☐ BIOS
- ☐ Disk Thrashing
- ☐ External / Internal
- ☐ Firmware
- ☐ Hard Disk
- ☐ Primary / Secondary Storage
- ☐ Volatile
- ☐ Capacity
- ☐ Characteristic
- ☐ Durability
- ☐ Estimate
- ☐ Magnetic
- ☐ Optical
- ☐ Overheads
- ☐ Portability
- ☐ Reliability
- ☐ Solid State
- ☐ Speed

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What will we be learning?

Section 02 – Data Representation

1

Why this? Why now?

Along with Section 01, this unit is the building block for the students going forwards, the remaining principles being used in the understanding of how data is sent around the world (Section 03 - Networks), kept secure (Section 04 - Security) and used to create programs (Section 05 - Software). Without understanding the core elements of this unit the further items are limited.

What will we learn?

This is literally the core principle that the whole of computing is based upon, not just in the academic subject but within the development of the digital age. Students build on their KS3 knowledge from both Computing and Maths, with the number systems, in order to discover how computers store numbers, characters, images and sound. Students will go beyond the elements introduced in KS3, investigating compression methods as well as hexadecimal conversions.

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.

How will I be assessed?

End of Unit Forms MCQ

Key Words:

- ☐ Bit
- ☐ Nibble
- ☐ Byte
- ☐ Kilobyte
- ☐ Megabyte
- ☐ Gigabyte
- ☐ Terabyte
- ☐ Petabyte
- ☐ Binary
- ☐ Denary
- ☐ Hexadeximal
- ☐ Representation
- ☐ Transistor
- ☐ ASCII
- ☐ Character
- ☐ Unicode
- ☐ Character Set
- ☐ Pixels
- ☐ Metadata
- ☐ Colour Depth
- ☐ Resolution (image)
- ☐ Quality
- ☐ File Size
- ☐ Bitmap
- ☐ Vector
- ☐ Pixelated
- ☐ Sample
- ☐ Sample Rate
- ☐ Duration
- ☐ Bit Depth (sound)
- ☐ Wavelenght
- ☐ Sample Frequency
- ☐ Sample Size
- ☐ Compression
- ☐ Lossy
- ☐ Lossless
- ☐ Run Length Encoding (RLE)
- ☐ Huffman Tree Encoding

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What will we be learning?

Section 04 – Security

Why this? Why now?

Students have recently visited the Section 03 - Networks content within the Year 9 unit 'how the internet works' therefore have knowledge related to many of the elements in this section. We made the decision to leave the development of the Key Stage 3 understanding (from Section 03) until later in the year, but this does not impact the understanding needed for this unit.

What will we learn?

Students discover more about the threats to computer systems in the wider world, as well as the methods and means that copmanies have in order to protect these core services.

What opportunities are there for wider study?

Advancing the knowledge developed through the esafety and cyber security lessons in Key Stage 3. The students are given more information about the reasons behind why people might choose to engage with the illegal activity of 'hacking', including from a finacial, espionage and activist points of view. Students also have more opportunity to discuss at this level, as there is more disucssion around how these work, within the context of protecting the systems and computers. It is made very clear how this unit links to the ethics and legislation unit, with a focus on the Computer Misuse Act.

How will I be assessed?

MCQ

Mini EOU (due to the size of the unit, also features in the Section 05 - Software formal end of unit).

Key Words:

- ☐ Malware
- ☐ Viruses
- ☐ Worms
- ☐ Trojan Horses
- ☐ Phishing
- ☐ Social Engineering
- ☐ Data Interception
- ☐ Brute force attacks
- ☐ DDOS
- ☐ Botnet
- ☐ Exploit
- ☐ SQL injection
- ☐ Penetration testing
- ☐ Anti-malware
- ☐ Firewalls
- ☐ User access levels
- ☐ Passwords
- ☐ Encryption
- ☐ Cipher
- ☐ Key

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What will we be learning?

Section 05 – Software

Why this? Why now?

Students learn about System Software at this point in their journey because it gives them the knowledge to keep organised and the importance to keep drivers updated this can also link well into previous sections like Section 4 - Network Threats which includes encryption which is also a type of utility software. With knowledge from section 2 – Data Representation students can understand how components of a computer represent data in binary. So, students could explore with some programming in this unit and how the processor works in storing/retrieving this data.

What will we learn?

Operating Systems Utility Software

What opportunities are there for wider study?

System Software gives the opportunities for students to learn how to keep their files and users managed and the way this can help the processor and memory. This also gives students base knowledge of how components work together in the background, linking well with section 10 – Logic and Languages where the students will look at arithmetic logic that works in the ALU part of a Central Processing Unit, as well as exploring some low-level language. This will all then be explored further in A-Level Computing.

How will I be assessed?

MCQ

Mini EOU

Key Words:

- ☐ Command Line Interface
- ☐ Graphical User Interface
- ☐ Operating System (OS)
- ☐ Systems software
- ☐ User Interface
- ☐ Data
- ☐ Device Driver
- ☐ Memory Management
- ☐ Multitasking
- ☐ Peripheral
- ☐ Access rights
- ☐ File management
- ☐ User management
- ☐ Ciphertext
- ☐ Encryption
- ☐ Interception
- ☐ Key
- ☐ Operating System
- ☐ Plaintext
- ☐ Utility Program
- ☐ Defragmentation
- ☐ Files
- ☐ Fragmentation
- ☐ Hard Drive
- ☐ Data Compression
- ☐ Lossless
- ☐ Lossy

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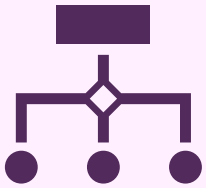
What will we be learning?	Why this? Why now?	Key Words:
Section 07 – Algorithms 	Students learn how to go about solving problems and the processes that are taken to drawing up algorithms these are required to be learnt as a design process towards programming as it makes the next stages of solving problems more efficient. This section is great to learn at this point as it links well into section 8 where the students will explore programming in python so with the design process towards this learnt allows them to easily follow an algorithm when programming.	

What will we learn?

Computational thinking Pseudocode Flowcharts

Searching Algorithms

Sorting Algorithms

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 computing specific, so it opens up many different opportunities in the future. Students are then also able to apply algorithms in section 8 which is all about programming and it shows they can follow an algorithm when creating a program. A lot of algorithms can come up in final exams so it gives students many opportunities to see exam style questions that they can answer. Many lessons of this section can be taught unplugged and with group work which gives good teamwork opportunities which they can find themselves working in teams in the future.

How will I be assessed?

Algorithm Challenges Exam Questions

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What will we be learning?

Section 08 –

Programming

Why this? Why now?

Students begin to look at programming as further down the line they start looking at more complex languages. So to dive in early with python which is a simpler language eases them nicely into looking at other languages later in their education. With section 7 learnt many algorithms can be used for students to program making this process easier and more efficient for them meaning these sections can blend into one so they have a lot of time to learn these concepts, but it does come as a sizeable portion of their final exam. So, a lot of exploration for these concepts will be extremely useful for the students.

Key Words:

What will we learn?

Selection Sequence Iteration

String Manipulation Data types

1/2D Arrays / Records SQL and File Handling Subroutines

What opportunities are there for wider study?

Programming opens many opportunities for large tech companies in the future. Also programming environments can be accessed anywhere at any time so students can look at creating programs early which can be an incredibly good opportunity if they are able to create something ground-breaking. Students will be asked to create programs in final exams based on algorithms so with both section 7 and 8 knowledge they will be able to answer these questions.

How will I be assessed?

Programming Challenges Chat Bot

Exam Questions End of Unit (including Section 07 content)

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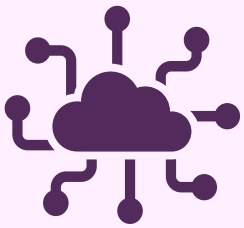
What will we be learning?

Section 03 – Networks



Why this? Why now?

Students have recently visited the Section 03 - Networks content within the Year 9 unit 'how the internet works' therefore have knowledge related to many of the elements in this section. We made the decision to leave the development of the Key Stage 3 understanding until closer to their mock, in order to support the spaced practise as well as developing a deeper understanding of the content.

What will we learn?

Students will investigate how computers transmit data to each other, through the use of differnet types of networks and how these are constructed too. The information highways around the world will be addressed, linking back to some key information from the previous units. Students also have the opportunity to understand how the networking at the school works, investigating different parts of the school and how these interconnect.

What opportunities are there for wider study?

Students have previously investigated this content directly, in Key Stage 3, but also have a knowledge of how data is stored (Section 02) and how computers need to process this data (Section 01).

How will I be assessed?

Portfolio improvement (form Y9)

Key Words:

- ☐ Network
- ☐ LAN
- ☐ WAN
- ☐ Packet
- ☐ Wireless access point (WAP)
- ☐ Router
- ☐ Switch
- ☐ Network interface card (NIC)
- ☐ Transmission media
- ☐ Network performance
- ☐ Client
- ☐ Server
- ☐ Peer
- ☐ Topology
- ☐ Mesh Network
- ☐ Star Network
- ☐ Partial Mesh
- ☐ Full Mesh
- ☐ Wired
- ☐ Ethernet
- ☐ Wi-Fi
- ☐ Bluetooth
- ☐ Internet
- ☐ DNS
- ☐ Hosting
- ☐ The cloud
- ☐ Web servers and clients
- ☐ IP Address
- ☐ MAC Address
- ☐ Encryption
- ☐ Packet switching
- ☐ Layers
- ☐ Standards
- ☐ Protocols
- ☐ TCP/IP
- ☐ HTTP
- ☐ HTTPS
- ☐ POP
- ☐ SMTP
- ☐ IMAP
- ☐ FTP

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What will we be learning?

Section 06 –

Ethics

Why this? Why now?

Students have more time to develop their understanding of computing in the wider world. This means that, when discussing elements within this unit, there are more opportunities for students to see links themselves.

This is the final part of the 'paper 1' curriculum, which covers all of section 1 to section 6.

What will we learn?

Students will investigate some core elements surrounding the ethics of computing, including: social/moral, environmental, legal and cultural.

These four elements combine to allow students to give a develop answer when asked a complex question, as this unit is normally assessed in the longer form. Time will be spent in lesson developing the student responses to these kinds of questions, as well as sharing the marking process to help fully understand the requirements.

What opportunities are there for wider study?

Further research, formally and informally, with different computer related news articles. Students can 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 it's own unit as it does here, as this builds the foundation for future understanding.

How will I be assessed?

End of unit assessment including multiple choice options, medium (2-3 mark) questions and longer style questions, as covered throughout teaching this unit.

Key Words:

- ☐ Digital technology
- ☐ Ethics
- ☐ Principles
- ☐ Professional bodies
- ☐ Character sets
- ☐ Cultural
- ☐ Digital Divide
- ☐ Environmental
- ☐ Computer Misuse Act 1990
- ☐ Copyright Designs and Patents Act 1988
- ☐ Legal Issues
- ☐ Privacy
- ☐ The Data Protection Act 1998
- ☐ Accurate
- ☐ Adequate
- ☐ Data Protection Act 2018
- ☐ Fair
- ☐ Hacking
- ☐ Lawful
- ☐ Modification
- ☐ Personal details
- ☐ Relevant
- ☐ Secure
- ☐ Unauthorised access
- ☐ Copyright Designs and Patents Act
- ☐ Creator
- ☐ Distribute
- ☐ Licence
- ☐ Bugs
- ☐ Compiled code
- ☐ Open source
- ☐ Proprietary
- ☐ Source code

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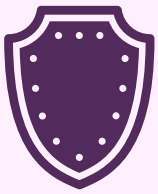
What will we be learning?

Section 09 –

Defensive Design



Why this? Why now?

This unit makes more sense to implement after more time has been spent developing experience with programming. Students need to be able to apply their experience to this new knowledge, in order to label these properties.

What will we learn?

Students investigate why programs may be susceptible for misuse, which links to the earlier unit of Threats. Students also investigate how the computer programs need to anticipate that the end users are not very good at following instructions and that this needs to be accounted for in their program design. It's also a good opportunity to revisit the programming constructs around the subroutines/programs and the procedures around this.

What opportunities are there for wider study?

Investigating how the different forms of attack (from section 4 and their previous cyber security units) may be combatted in their code. Further investigating and use of maintainability procedures for future (and past) elements of code.

How will I be assessed?

Multiple Choice Quiz

End of Unit Formal Assessment

Key Words:

- ☐ Authentication
- ☐ Defensive design
- ☐ Misuse
- ☐ Robust
- ☐ Input
- ☐ Validation
- ☐ Function
- ☐ Maintainability
- ☐ Procedure
- ☐ Sub program
- ☐ Convention
- ☐ Indentation
- ☐ Comment
- ☐ Execution

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What will we be learning?

Section 10 –

Logic and Languages

Why this? Why now?

Students have experance with using the logic gates (AND, OR and NOT) within programming so the formal wording that this section introduces is going to clarify their use. Students have also had experience writing and running programs using a high level language and been given an understanding in the process behind the CPU, the level of language investigation links these two elements together.

What will we learn?

Students will investigate the core gate functions (AND, OR and NOT) and how these can be notated through Boolean Notation, Diagrams and Truth Tables. These are then combined to make logic circuits, using 2 or more of these individual elements. This can also be shown using the above notation types.

After this the students investigate the development of programming, through initially discovering how CPUs need to have their instructions held, using only 1s and 0s. Students can then see the steps that early computer scientists took in the development of the different programming languages, from Assembly to high level declarative…

What opportunities are there for wider study?

Investigating how these elements work in a wider setting and whilst programming different elements. Students could also link these ideas with the declarative language SQL which is briefly covered in Section 08 – Programming, which uses the core logic function to make vastly complex data models. The website sqlbolt.com is a very good resource to help with this.

How will I be assessed?

End of Unit Assessment

Key Words:

- ☐ Logic gate
- ☐ Transistor
- ☐ Bit (Binary digit)
- ☐ Logic circuit
- ☐ AND
- ☐ OR
- ☐ NOT (Inverter)
- ☐ A ∧ B
- ☐ A v B
- ☐ Translator
- ☐ Compiler
- ☐ Interpreter
- ☐ Assembler
- ☐ Machine Code
- ☐ Assembly Language
- ☐ High Level Language
- ☐ Low Level Language
- ☐ Declarative
- ☐ Imperative