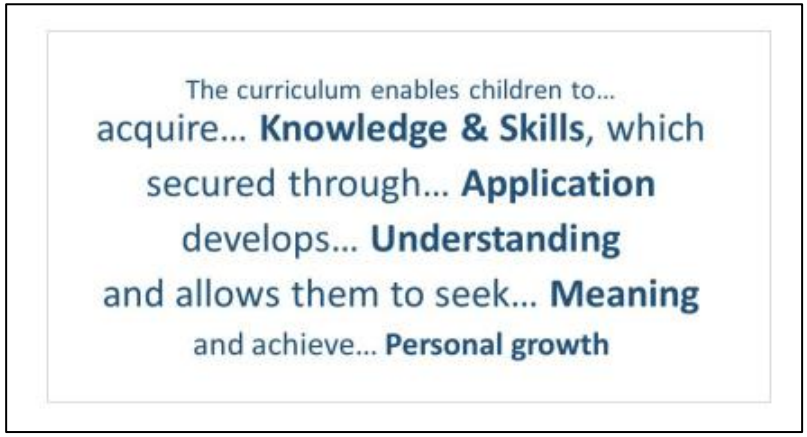
Key Stage 3

Curriculum Excellence

Computing



Contents:

CLF KS3 Curriculum Principles

- The curriculum enables children to acquire **knowledge and skills**, which are secured through **application** (over time and in different contexts) to develop **understanding** (change in long term memory) and allows children to seek **meaning** and achieve **personal growth**.
- Built-up from KS2 to secure a foundation for young people for life (… and KS4). **Based on Age Related Expectations and using DOYA.** (Not built down from KS4).
- Focused on the **progression of content and concepts** through the KS3 curriculum that accelerates progress within a **progressive and purposeful 3-19 CLF Curriculum.**
- The curriculum is our opportunity to inspire children to be **successful individuals, historians, mathematicians, geographers, musicians, authors, artist, sportspeople, scientists, writers, innovators, dreamers, magicians, mothers, fathers, positive citizens.**
- On a platform of standardisation the curriculum releases teachers to drive up learning and progress. **Standardised Age Related Expectations, curriculum and assessment** frees and empowers experts to collaborate, follow the learning and teach.
- The curriculum will be **curated by subject experts and teams from across the Trust** who are empowered to evolve the curriculum that will allow all children to thrive.
- The content of the curriculum is progressive and is based on **consolidating and revisiting** content over time to secure progress over time.
- The curriculum seeks **depth of study rather than breadth** to build understanding and to seek meaning; stretching and challenging children to think.
- The Age Related Expectations and exemplars are **widely published** to support child, parent, teacher, leader and other staff understanding of the expected standards and the content of the curriculum, **enabling wider ownership of the curriculum**
- **Two key areas of assessment:**
    - **Shared on-line MCQ assessments four times a year** to assess knowledge/skills acquisition and elements of application and understanding. Immediate feedback from on-line supports understanding of gaps and re-teaching.
    - **Teacher assessment of learning that uses standardised exemplar material** to assess agreed subject written responses/assessments, supporting teachers to make a broad assessment of children's attainment against DOYA.
- Given the shared AREs and assessment cycle teachers are freed to **plan to meet need** and support all children to feel and be successful. Approaches to **pedagogy are based on cognitive science**:
    - Supporting children to experience **desirable difficulty** and grapple with learning in their proximal zone.
    - Explicitly secure **knowledge and skills** through **application** to build **understanding and seek meaning**
    - **Specificity of feedback** for impact and the **developed and precise use of modelling, explanations and questioning** to secure progress.
    - Emphasis on the development of **reading (widely and often), oracy and quality of writing**.

KS3 Computing in the Cabot Learning Federation

To develop students understanding of computational thinking, providing necessary problem solving through abstraction, decomposition and pattern recognition. A future focused subject, which develops transferable life skills preparing them for a successful career, including that in a rapidly growing digital industry.

A scientific curriculum allowing students to make informed decisions about the use of technology they are using, through the enjoyment of discovery and exploration.

We understand that students bring a varied experience from KS2. Our aim to provide and deliver a curriculum that provides rigour and depth that prepares for KS4 and helps develop the whole student with a strong focus on embedding skills such as numeracy and literacy as part of the curriculum.

We aim to provide outstanding delivery through a consistent and collaborative approach which will benefit learners across the CLF to be competitive in the world of tomorrow.

ARE Descriptors

Year 7			
KS2 Prior Learning	**Knowledge and Skills**	**Understanding**	**Meaning**
What is the key knowledge, skills, understanding and meaning that children bring from the AREs in KS2 in this subject?	**What is the key knowledge and skills that we want to pass on to children as ARE in Year 7 that build up from KS2?**	**What do we want children to build through the application of knowledge and skills, including key concepts and misconceptions?**	**What is the meaning that we want children to seek by age that supports their personal growth?**
Students arrive with varying experiences in computing. Recent cohorts have arrived with very little in the way of ICT skills -file/folder organisation. Some students have limited experience of using visual programming (e.g. Scratch).	Students will learn how to use computer systems correctly in the academy including how to be safe online. They will learn how to manage their work in an organised way and how cloud storage can be supportive and enable collaboration.	The importance of password security in their daily lives. Techniques to remain safe online and who you can go to. The benefits and limitations of cloud storage.	**The need for a secure password is key in the digital age and modern technology.** **Remaining safe using technology at all times.** **Utilising cloud computing effectively can help them in all aspects of school and personal life.**
	Students will discover how devices can be used to input/store and output data. They will have knowledge of different types of storage used in a range of digital devices. They will have knowledge of what makes an embedded system.	Students will understand the differences between input/output/ storage devices using suitable examples. They will understand the role and need for a CPU in systems. They will understand why some systems are considered embedded using suitable examples.	**Every computer system (including ones not traditionally seen as computers e.g televisions) will have key components: input, process, output, storage.** **Common embedded systems are used in homes all the time**

	Students will learn to problem solve using computing. They will learn how to remove unnecessary details, break down problems and begin to produce step by step solutions.	Problems need to be broken into simple solvable steps, removing unnecessary detail in order to ensure that the main problem can be solved. Computers are programmed using these step by step instructions.	**Problem solving is a life skill which is transferrable to all aspects of life.** **Computers need to be programmed using step by step instructions so that they can carry out tasks.**
	Students will learn how data is represented by a computer, they will learn how computers use and convert binary numbers. They will discover how computers represent characters using binary numbers	Understand the relationship between how computers and humans see data. The process of how binary data is used to represent numbers and characters All data that we enter into a computer will be converted in binary. This is because computers have electrical switches that can be on/off, 1/0 , true/false.	**Data representation and how data is stored on computer will directly affect students' ability to store/download images, sound, video and other media. How the quality of media is affected by data representation.**

Year 8			
Year 7 Prior Learning	**Knowledge and Skills**	**Understanding**	**Meaning**
What is the key knowledge, skills, understanding and meaning that children bring from the AREs in Year 7 in this subject?	**What is the key knowledge and skills that we want to pass on to children as ARE in Year 8 that build up from Year 7?**	**What do we want children to build through the application of knowledge and skills, including key concepts and misconceptions?**	**What is the meaning that we want children to seek by age that supports their personal growth?**
8.1 Computer systems (yr 7) Computer systems - students School systems: Logging in. Profile settings (passwords). Health and safety including E-Safety . File management. Cloud computing – Using online platforms, collaboration project –esafety and digital footprint.	Students develop their understanding by learning how computers operate in a network. They learn how devices use different technology to communicate with each other and the hardware needed. Students learn the security implications of data being shared/travelling within networks	There are different methods of connecting devices together and everything is not 'wifi'. Data security is a real concern in today's world and students need to know how to keep their computers safe from malicious activities such as malware/hacking. To understand there are different types of networks that they use all the time (LAN/WAN/WPAN)	**Network connection methods have an impact on the speed of data transfer.** **Different connection methods should be considered for different applications.** **It is common for everyone to be communicating in a large network (internet) and to understand how to keep data safe.**
8.2 Hardware Input and Output devices Internal and external devices Storage devices The role of the CPU in computer systems The concept of an embedded system	Students develop their hardware knowledge by learning how the CPU processes data and interaction with RAM. Students begin to discover factors that affect the performance of computing systems and learn how	Students are able to state how a performance of a system is affected by its hardware - CPU, RAM, Virtual memory, Storage device type. Storage devices can be selected appropriately given a context.	**Students can start to make an informed choice when deciding on specification for computer systems e.g. CPU clock speed, number if cores, cache memory.**

	RAM/virtual memory impact a system. Students apply their knowledge of storage devices further by understanding the characteristics and applying them in a given context.	RAM does not make a computer necessarily run faster but does allow more programs to run at once time.	**They understand why opening many applications at one time may slow down the performance of a system** **They can also understand that this is why prices vary for different systems**
8.3 Computational thinking Computational thinking and some Programming constructs: Abstraction Decomposition Pattern recognition Algorithms Sequence Selection	Students will know how to write algorithms using flowcharts and what Students will know what variables are used to store data which has the ability to change and that computer programs need to understand the "type" of data in order to process it correctly. Students will learn about the 3 main programming constructs (sequence, selection and iteration) and know when each construct needs to be used. Students will learn about the why computer programs need to be tested.	Students will develop their understanding of computational thinking by applying their acquired skills (abstraction, pattern recognition, decomposition and algorithms) to new situations. In addition to this understand that iteration can improve efficiency of their algorithm and program design. Students build on their understanding of variables to consider how a range of mathematical, Boolean and relation operators can be used to help solve problems. They will also be able to select and justify data types for variables in order to solve a problem. Students use their understanding of testing to decide what tests are	**Students see the importance of computational thinking to solve problems, as planning the detail first means that they focus on the brief they have been given and** **They also see the importance of trying to solve problems in the most efficient way possible, as this makes algorithms and programs much easier to debug, update and gives the CPU less instructions to process.**

		appropriate for their computer program and consider the "purpose" and "expected results".	
8.4 Data representation Units of data : • Recognise the difference between data (0,1) and information – numbers/text/sound/images/video • Know that digital computers use binary to represent all data • Understand the relationship between binary and file size • Binary basics : • Under how binary numbers are stored in hardware (transistors) • Understand the difference in numbering systems (Base 2 - binary; Base 10 – denary/decimal) • Convert denary to 8 bit binary and 8bit binary to denary using the binary table Character sets (ASCII) :	Students develop their knowledge by learning how to add binary numbers and explain the concept of an 'overflow ' error. They develop their understanding of character sets to understand extended ASCII and Unicode. Students will develop their knowledge of images and how computers represent them. • **Resolution** • **Pixels** • **Colour depth**	Students will develop their understanding of how computers store data giving suitable examples. They will understand the differences between character sets and why they moved to Unicode. They will begin to show more independence in the techniques/accuracy used in binary/denary conversions with larger numbers.	**Students grasp an understanding that all data is stored in a computer system as binary code. Whether it is images, characters or numbers, the key theme is that unique binary codes are needed. For example, an individual character or colour needs a unique code so that the computer can display the correct character/colour on the screen.** **They will see the links with their learning in Maths. E.g. Hundreds, tens and units columns multiply by 10 each time because there are 10 digits to choose from, therefore binary headings multiply by two because there are only 2 digits to choose from (0, 1). In addition to this, they will notice that like in maths, they assess different methods of converting denary**

• Understand the need for and use of character sets (e.g. ASCII) Be able to convert ASCII into binary and reverse			**and binary and decide which is the best method to use for a given situation (e.g. a high number over 200 might start with putting the 0s in first instead of the 1s, or other shortcuts to work out the answer quickly)**

Curriculum and Assessment Skeleton

Year 7				
ARE Point	**1**	**2**	**3**	**4**
Unit Title	Computer Systems **How do we use computers responsibly in the real world?**	Hardware **What makes our computers function?**	Computational Thinking **How do we begin to solve problems using a computer?**	Data representation **How and why do computers understand data differently to us?**
MCQ	20 questions	20 questions	20 questions	20 questions
DOYA	Long answer questions		Long answer questions	

Year 8				
ARE Point	**1**	**2**	**3**	**4**
Unit Title	Computer Systems **How and why do computer systems talk to each other?**	Hardware **How does certain hardware effect the performance of a system?**	Computational Thinking **How can we begin to program a computer to solve problems?**	Data representation **How do computers represent more than numerical data?**
MCQ	20 questions	20 questions	20 questions	20 questions
DOYA	Long answer questions		Long answer questions	

Medium Term Plan

<table>
<tr><td>Subject: Computing</td><td colspan="2">Unit Title: Year 7 Computer Systems - 5 weeks
How do we use computers responsibly in the real world?</td><td>ARE Point: 7.1</td></tr>
<tr><td colspan="2">Key Essentials:
School systems: Logging in. Profile settings (passwords). Health and safety including E-Safety. File management.

Cloud computing – Using online platforms, collaboration project – esafety and digital footprint.</td><td colspan="2" rowspan="2">WHY are children LEARNING this?
Students need to be able to use the computer systems safely and confidently. We cannot assume that all students have a good grounding of Esafety - we need students to understand their role and responsibilities when using online services.</td></tr>
<tr><td colspan="2">Content:
Logging details saved in a format that students can revisit each week for internal systems – e.g. network, SMH, One drive.
Password protection – what makes a strong password.
How to stay safe in a computer room.
File management (home drive/shared drive)
Cloud computing – One drive, office online. Using software collaboratively e.g. Powerpoint online to create an Esafety project. What is cloud computing. Advantages and disadvantages of cloud computing.</td></tr>
<tr><td colspan="2">Concepts: Students are able to explain the importance of having a strong password. Students are able to explain the benefits and drawbacks of cloud computing and make suitable decisions.</td><td colspan="2">HOW will ORACY, READING and WRITING be developed?

Literacy
Correct use of command words, in line with the OCR specification</td></tr>
</table>

Terminology and Vocabulary (subject specific and academic): E-Safety Folder Management Cloud Server Security Netiquette Privacy Collaborate Internet Wireless	• **Describe**: Give a detailed account or picture of a situation, event, pattern or process • **Explain**: Give a detailed account including reasons or causes. • **Discuss**: Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence. Examples to use with questioning and in extended writing activities • **Describing** how to create a secure password • **Explaining** why strong passwords are needed (e.g. What might happen if you did/did not use a strong password • **Discussing** the advantages of using cloud computing instead of using locally stored application
Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…	**WHAT will PROGRESS look like in this unit? Students can use some of the key terminology** The idea of standards – what does DOYA look like but also what does progress look like? What are the different routes that children might take? What does challenge look like?

Medium Term Plan

<table>
<tr><td>Subject: Computing</td><td colspan="2">Unit Title: Hardware - 6 weeks
What makes our computers function?</td><td>ARE Point: 7.2</td></tr>
<tr><td colspan="2">Key Essentials:
Input and Output devices
Internal and external devices
Storage devices
The role of the CPU in computer systems
The concept of an embedded system

Suitable real life examples given where appropriate to support the essentials</td><td colspan="2" rowspan="2">WHY are children LEARNING this?

Computer hardware is an integral part of the curriculum at KS4. Students will have experience of using the hardware but will not have categorised them under the different headings such as Input/output/storage. This unit starts to challenge students on how computers function, explaining the various computers they use from day to day such as laptops/tablets to those with embedded systems such as microwaves, televisions and dishwasher.</td></tr>
<tr><td colspan="2">Content:

• To show understanding of the difference between input and output devices with suitable examples.
• To understand the difference between internal and external devices with suitable examples.
• To describe the different types of storage
  ○ (magnetic / optical / solid state)
• To understand the role, purpose of the CPU and the relationship with RAM - (Fetch/Decode/Execute cycle not needed)
• To show an understanding of an embedded system including suitable examples</td></tr>
<tr><td colspan="2">Concepts:

To list difference input and output devices
To describe the purpose of input and output devices</td><td colspan="2">HOW will ORACY, READING and WRITING be developed?

Literacy
Correct use of command words, in line with the OCR specification</td></tr>
</table>

To list different external and internal devices correctly. To describe the role of different devices and what functionality they provide to the user. To list different storage devices correctly To identify the type of storage device correctly. To begin to explain the need for different types of storage To identify the term CPU as a processor and what this means To identify the term RAM as primary storage and what this means. To describe the purpose for CPU and RAM in a computer system To describe the term embedded system To identify examples of embedded systems and their purpose	• **State**: Give a specific name, value or other brief answer without explanation or calculation. • **Describe**: Give a detailed account or picture of a situation, event, pattern or process • **Explain**: Give a detailed account including reasons or causes. • **Analyse**:: Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions Examples to use with questioning and in extended writing activities • **Stating** whether a peripheral is an input, output or storage device. • **Describing** how different devices work in relation to input, processing and output. • **Explaining** what input, output and storage devices are by using examples. • **Describe** how different components work • **Analyse** which component would be best to upgrade based on a given scenario.
Terminology and Vocabulary (subject specific and academic): Input Output Storage Peripherals Magnetic Solid state Optical Central Processing Unit Processing Random Access Memory Memory Embedded	
Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…	**WHAT will PROGRESS look like in this unit?** The idea of standards – what does DOYA look like but also what does progress look like? What are the different routes that children might take? What does challenge look like?

Medium Term Plan

Subject: Computing	**Unit Title: Computational Thinking - 6 weeks** **How do we begin to solve problems using a computer?**	**ARE Point: 7.3**
Key Essentials: Computational thinking and some Programming constructs: Abstraction Decomposition Pattern recognition Algorithms Sequence Selection	**WHY are children LEARNING this?** This is a key part of the learning required for Y8 computing and for when students are working at GCSE level. Computational thinking and in particular using algorithms to solve problems are a large part of the exam paper at GCSE.	
Content: Understand that abstraction means to extract the necessary information needed to solve a problems. Understand that decomposition is used to break down problems in to step by step tasks. Recognise that similar sets of instructions can be written in different ways to solve one problem. Understand that an algorithm is a set of instructions. In their programs students will: Create a sequential list of instructions to solve problems using a high level programming language. Create programs using selection statements using a high level programming language.		
Concepts: Students will be able to use abstraction to extract the necessary information needed to solve a variety of problems.	**HOW will ORACY, READING and WRITING be developed?** Literacy Correct use of command words, in line with the OCR specification	

<table>
<tr>
<td>Students will be able to use decomposition to break down problems in to manageable tasks.
Students will be able to write instructions that are similar, that solve the same problem in different ways.
Students will be able to create a sequential list of instructions to solve problems.

In their programs students will:
Write programs to solve problems in a high level programming language.
Write programs to solve programs using selection statements in a high level programming language.</td>
<td rowspan="2">

Describe: Give a detailed account or picture of a situation, event, pattern or process
Explain: Give a detailed account including reasons or causes.
List: Give a sequence of brief answers with no explanation.
Design: Produce a plan, simulation or model
<u>Evaluate</u>: Assess the implications and limitations; to make judgements about the ideas, works, solutions or methods in relation to selected criteria.

Examples to use with questioning and in extended writing activities

<u>Describe</u> what is meant by abstraction/decomposition/pattern recognition.
<u>List</u> a set of instructions to.....
<u>Explain</u> the advantages of using....
<u>Design</u> an algorithm that will....
<u>Evaluate</u> your solutions and decide which one best meets the success criteria and ways in which it can be improved.

</td>
</tr>
<tr>
<td>Terminology and Vocabulary (subject specific and academic):
Abstraction
Decomposition
Pattern recognition
Algorithms
Sequence
Selection</td>
</tr>
<tr>
<td>Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…</td>
<td>WHAT will PROGRESS look like in this unit? The idea of standards – what does DOYA look like but also what does progress look like? What are the different routes that children might take? What does challenge look like?</td>
</tr>
</table>

Subject: Computing	**Unit Title: Data Representation 7 weeks** **How and why do computers understand data differently to us?**	**ARE Point: 7.4**

Key Essentials:
Units of data , Binary basics – link to hardware, Binary conversion (base 2 > base 10) , Character sets – what is ASCII and using

Content:

Units of data :

- Recognise the difference between data (0,1) and information - numbers/text/sound/images/video
- Know that digital computers use binary to represent all data
- Understand the relationship between binary and file size

Binary basics :

- Under how binary numbers are stored in hardware (transistors)
- Understand the difference in numbering systems (Base 2 – binary; Base 10 - denary/decimal)
- Convert denary to 8 bit binary and 8bit binary to denary using the binary table

Character sets (ASCII) :

- Understand the need for and use of character sets (e.g. ASCII) Be able to convert ASCII into binary and reverse

WHY are children LEARNING this?
Students need to understand the concept of machine code and that computers need to convert the information we give them into binary. Understanding the concept of binary will allow them to then look further in Year 8 when they learn about how images/sound are represented by binary.

An introduction to character sets will allow students to develop their understanding in Year 8 where they will be introduced to extended ASCII and then Unicode.

Concepts: Students are able to identify the number of bits in different units of data using correct terms, e.g. Bit, Nibble, Byte, Megabyte, Gigabyte, Terabyte.
Students can describe why computers use binary.

HOW will ORACY, READING and WRITING be developed?

Literacy
Correct use of command words, in line with the OCR specification

Students can explain the difference between base 2 and base 10 numbering systems. Students can use the correct place values for base 2 and base 10. Students can calculate the value of different numbers when converting between base 2 (binary) and base 10 (denary) using the binary table- showing their workings Students can explain how characters are stored and used in a computer system and explain how binary is used to store characters in a character set.	• **Describe**: Give a detailed account or picture of a situation, event, pattern or process • **Explain**: Give a detailed account including reasons or causes. • **Analyse**:: Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions Examples to use with questioning and in extended writing activities • **Describe** why computers use binary • **Analyse** the different methods of converting binary and denary and decide which method is best for a given number. • **Explain** how characters are stored in a computer system Numeracy • Understanding of why the numbers double each time • Pattern recognition. E.g. 1111 is 15 in denary because the next heading is 16, 11111 is 31 because the next heading is 31 etc. • Different methods to solve the problem (e.g. using 1s for the addition method and 0s for the subtraction method)
Terminology and Vocabulary (subject specific and academic): Bit Nibble Byte Megabyte Gigabyte Terabyte. Binary Denary/Decimal Place value Base 2 Base 10 Binary table ASCII	
Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…	**WHAT will PROGRESS look like in this unit?** The idea of standards – what does DOYA look like but also what does progress look like? What are the different routes that children might take? What does challenge look like?

Medium Term Plan

<table>
<tr><td>Subject: Computing</td><td colspan="2">Unit Title: Computer Systems (in networks) 5 weeks
How and why do computer systems talk to each other?</td><td>ARE Point: 8.1</td></tr>
<tr><td colspan="2">Key Essentials:
Computer networks (LAN, WAN and WPAN)
Hardware required to connect to different networks
Methods to connect to different networks
Factors which affect networks (Range, cost, security and data transfer speed)
Computer system and network security (Firewalls, anti-malware, passwords and encryption)</td><td colspan="2" rowspan="2">WHY are children LEARNING this?
This topic will give students the knowledge and understanding to progress onto GCSE topics such as network topologies (star and mesh), peer to peer and client server networks and virtual networks.

In addition to this, they will also have the knowledge and understanding to progress onto network threats and measures</td></tr>
<tr><td colspan="2">Content: The sequence of delivery is important to avoid misconceptions!
Understand what is meant by a local area network
Hardware required
Methods to connect (WiFi and Ethernet) with advantages and disadvantages.
Understand what is meant by a wide area network and how it is different to local area network.
Methods to connect (GPRS (mobile), telephone cables and satellite) with advantages and disadvantages.
Understand how peripheral devices can connect to a computer system using a WPAN.
Methods to connect (Bluetooth) with advantages and disadvantages.
Understand the 4 main ways to protect your network from security threats such as malware and hacking
Firewall, anti-malware, passwords and encryption</td></tr>
<tr><td colspan="2">Concepts:
Apply their understanding of connecting computer systems in order to select the best connection for a given scenario.</td><td colspan="2">HOW will ORACY, READING and WRITING be developed?</td></tr>
</table>

- Be able to justify decisions for a given scenario based on the factors which affect networks.
- Select the correct hardware for a given computer network.
- Be able to select the correct security measure for a given scenario.

Terminology and Vocabulary (subject specific and academic):

LANs, WANs and WPANs
Data packets, Local area network (LAN), Peripherals, Router, Devices, Wide area network (WAN) , Wireless Access Point (WAP), Wireless personal area network (WPAN)

Methods of connecting to networks
Bluetooth, General Packet Radio Service, WiFi, Ethernet, Satellite, Telephone line.

Factors which affect networks
Cost effective, Data transfer speed, Range, security

Network security
Anti-malware software, Attachments, Decryption, Encryption, Ethernet, Firewall, GPRS , Key, Malware, Periodically, Quarantine, Security, Unauthorised.

Literacy
Correct use of command words, in line with the OCR specification

- **State**: Give a specific name, value or other brief answer without explanation or calculation.
- **Describe**: Give a detailed account or picture of a situation, event, pattern or process
- **Explain**: Give a detailed account including reasons or causes.
- **Discuss**: Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.
- **Analyse**: Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions**.**

Examples to use with questioning and in extended writing activities

- **State** what is meant by a local area network/wide area network/wireless personal area network.
- **Describe** the hardware needed to create a LAN.
- **Describe** the difference between a local area network and a wide area network.
- **Explain** 2 ways to keep your computer secure
- **Discuss** the advantages of using Ethernet in comparison to WiFi
- Analyse what network/connection types a user/business should use based on a given scenario.

Numeracy
Understanding concepts for transfer speeds (MBps) making comparisons of speed and range of networks.

Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…	**WHAT will PROGRESS look like in this unit?** The idea of standards – what does DOYA look like but also what does progress look like? What are the different routes that children might take? What does challenge look like?

Subject: Computing	**Unit Title: Hardware -6 weeks** **How does certain hardware effect the performance of a system?**	**ARE Point: 8.2**

Key Essentials:

CPU – Fetch/execute cycle
CPU – Factors affecting performance
Memory / Virtual memory
Secondary storage – factors affecting choice of storage

WHY are children LEARNING this?

The main components of the computer system is an integral part of the course at KS4. Students will understand how computer components affect the performance of a system so they can start to make an informed choice on what are the benefits and limitations of different systems.

Students extend their learning from year 7 with storage devices by beginning to understand the characteristics of each storage devices and learn identify and explain why certain types of storage devices are used in certain contexts for example why do mobile phones make use of solid state / flash storage.

Content:

The Fetch and Execute Cycle
Students will show a greater understanding of the CPU and RAM through the Fetch and Execute cycle.

Factors affecting performance
Students will identify the factors that affect the CPU performance using key terms

- Clock Speed
- Cache Size
- Number of cores

RAM/ROM/Virtual Memory
Students will show understanding of primary storage (volatile) and understand the function of RAM/ROM/Virtual memory

Factors affecting secondary storage
Students will show understanding of the multiple factors that affect the secondary storage

Capacity
Speed

<table>
<tr><td>Portability
Durability
Reliability
Cost</td><td></td></tr>
<tr><td>Concepts:
Students will describe the role of the CPU and RAM
Students will illustrate the Fetch and Execute cycle
Students will explain each individual process of the cycle.
Students will use the correct terminology

Students will describe the 3 different factors in relation to the CPU
Clock speed, Cache Size and Multiple cores
Students will begin to explain how to increase the performance based on the factors.

Students will describe the difference between primary and secondary storage with relation to RAM
Students will describe the purpose of ROM
Students will explain the need for virtual memory
Students will begin to analyse the need for virtual memory and explain the effects on a PC system (increase RAM vs Virtual memory)

Students will identify different characteristics of secondary storage (Capacity/Speed etc)
Students will identify the storage devices for the correct situation using some characteristics</td><td rowspan="2">HOW will ORACY, READING and WRITING be developed?

Literacy
Correct use of command words, in line with the OCR specification.
• State: Give a specific name, value or other brief answer without explanation or calculation.
• Describe: Give a detailed account or picture of a situation, event, pattern or process
• Explain: Give a detailed account including reasons or causes.
• Discuss: Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.
• Analyse: Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

Examples to use with questioning and in extended writing activities
• <u>State</u> the 3 steps that the CPU will perform
• <u>State</u> a secondary storage device used for
• <u>Describe</u> the purpose of ROM / RAM / Virtual memory
• <u>Explain</u> how to improve the performance of the CPU.
• <u>Discuss</u> the advantages of _____ using a solid state drive in comparison to other options available.
• <u>Analyse</u> the choice of secondary storage based on a given scenario.</td></tr>
<tr><td>Terminology and Vocabulary (subject specific and academic):
Volatile
Non volatile
Primary storage
Secondary storage</td></tr>
</table>

Read only Virtual Capacity Reliability Durability Cache Clock speed Multitasking	**Numeracy** • Calculating how many cycles per second using different measurements (e.g. 2GHz = 2 billion cycles per second, 50KHz = 50,000 cycles per second, 0.9GHz = 900,000 cycles per second) • Thousands (000), millions (000000) and billions (000000000) • Decimal places and large numbers (key misconception: 2.4GHz is 2,400,000,000 NOT 24,000,000,000) • RAM / Hard drive capacity – converting MB/GB/TB
Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…	**WHAT will PROGRESS look like in this unit?** The idea of standards – what does DOYA look like but also what does progress look like? What are the different routes that children might take? What does challenge look like?

Medium Term Plan

Subject: Computing	**Unit Title: Computational Thinking 6 weeks** **How can we begin to program a computer to solve problems?**	**ARE Point: 8.3**

Key Essentials:
 	
• Computational thinking
  • Abstraction
  • Decomposition
  • Pattern recognition
  • Algorithms
• Flowcharts
• Programming constructs
  • Sequence
  • Selection
  • Iteration
• Mathematical operators
• Iteration
• Testing / debugging
• Variables and data types
  • Data types (CRIBS – Character, Real, Integer, Boolean, String)
	WHY are children LEARNING this?
	
	This topic will give students the knowledge and understanding to progress onto GCSE topics such as
	• Understanding the difference between condition controlled and count controlled iteration
	• Understanding how functions can be used to solve problems
	• Arrays
	• Constants
	• Writing algorithms in pseudocode form	

Content: T Understand how the 4 parts of computational thinking are used to solve a range of problems.		

Understand why we use flowcharts to solve a problem and be able to model systems and programs using them. Understand the 3 main programming constructs and why they are needed Understand how variables are used in programming and the need to for the computer to understand which data type is being stored. Recognise and use Mathematical operators + - * / < > = . Understand why programs need to be tested and be able to spot errors and inefficiencies in algorithms/programs and correct them.	
Concepts: Create a flowchart for a given problem to assist with writing a program in a high level language. Interpret flowcharts and be able to explain what is happening. Write algorithms and programs that use selection and include mathematical operators. Be able to read an algorithm or program and spot/correct errors in pre written programs. Be able to identify when variables are needed to help solve a problem. Recognise data types and know when to use them. **In their programs students will:**	**HOW will ORACY, READING and WRITING be developed?** Literacy Correct use of command words, in line with the OCR specification • **Describe**: Give a detailed account or picture of a situation, event, pattern or process • **Explain**: Give a detailed account including reasons or causes. • **Analyse**:: Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions Examples to use with questioning and in extended writing activities • **Describe** the different operators • **Explain** how file size is affected by resolution and colour depth. • **Explain** why Unicode is used in modern computers

Write programs to solve problems that require the use of mathematical operators within programming constructs, such as sequence, selection and iteration. Select suitable programming constructs needed for a given problem (sequence, selection and iteration). Write programs using variables and the correct data types. Be able to test and debug programs they have written in a high level programming language. **Note: A high level programming language can be drag and drop (e.g. Scratch) or text based (e.g. Python)**	Numeracy • Maths terminology (algebra). For example "substitution" being used when replacing a value with a variable name. Using the term "calculation" instead of "sum". • Use of operators to make mathematical calculations. • Understanding the difference between > and < (Key misconception) using >= and <=
Terminology and Vocabulary (subject specific and academic): Computational thinking: Abstraction, Decomposition, Pattern recognition, Algorithms, Efficiency Flowcharts: Terminator, Process, Input/Output, Decision, Connector, Efficiency Programming constructs: Sequence, Selection, Iteration Mathematical operators: Addition, subtraction, multiplication, division, relational operators (> < >= <=), Boolean operators (AND, OR, NOT) Testing: Logic errors, debugging	

Variables and data types: Runtime, Character, Real, Integer, Boolean, String.	
Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…	**WHAT will PROGRESS look like in this unit?** The idea of standards – what does DOYA look like but also what does progress look like? What are the different routes that children might take? What does challenge look like?

Subject: Computing	**Unit Title: Data Representation - 7 weeks** **How do computers represent more than numerical data?**	**ARE Point: 8.4**
Key Essentials: Recap of units Recap of numbering system and conversion (Base 2, 10) Binary addition Character sets (ASCII (inc Extended ASCII) vs. Unicode) Images	**WHY are children LEARNING this?** The theory of data representation is a key part of the KS4 curriculum and some of the concepts students traditionally struggle with. Exposure to content in Y7 and further learning in Y8 will ensure students have a good grounding when revisiting and building upon in Y9.	
Content: Be able to RECALL FROM YEAR 7 : Understanding of "number systems" Understanding of terms "base 2" and "base 10 " and their meaning within Maths Understand the need for conversion between base 2 and 10 (human and computer) The process for adding two 8 bit binary numbers together. Overflow errors – why do these occur? Conversion Understand the need for conversion between base 2 and 10 (human and computer) Character sets (ASCII vs Unicode) * Understand the need for and use of character sets (e.g. ASCII) Learn how to convert ASCII into binary and reverse Understand why Unicode was invented Images Understand how images are stored in a computer Understand relationship between resolution, colour depth and filesize		

Concepts: Adding binary numbers together and identifying when there is an overflow error / explain the reason why. Character sets (ASCII vs. Unicode) Be able to convert ASCII into binary and reverse * Understand why Unicode was invented Explain how images are stored on a computer linking resolution, file size and colour depth to binary	**HOW will ORACY, READING and WRITING be developed?** Literacy Correct use of command words, in line with the OCR specification • **Describe**: Give a detailed account or picture of a situation, event, pattern or process • **Explain**: Give a detailed account including reasons or causes. • **Analyse**:: Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions Examples to use with questioning and in extended writing activities • **Describe** how an overflow error occurs • **Explain** how file size for an image is affected by resolution and colour depth. • **Explain** why Unicode is used in modern computers • **Analyse** the factors which may affect the size and quality of an image, based on a given scenario (e.g. needing to download an image from the internet, display in a glossy magazine etc). Numeracy • Understanding of why the numbers double each time • Pattern recognition. E.g. 1111 is 15 in denary because the next heading is 16, 11111 is 31 because the next heading is 31 etc. • Different methods to solve the problem (e.g. using 1s for the addition method and 0s for the subtraction methods.
Terminology and Vocabulary (subject specific and academic): **Binary** **Denary** **Overflow error** **Character set** **ASCII** **Extended ASCII** **Unicode** **Colour depth** **Resolution** **File size** **Pixels** **Pixilation**	
Extended Response (writing, performance or product): This should be the items used for DOYA, it might be a portfolio of work over time rather than one thing… A minimum or core amount…	**WHAT will PROGRESS look like in this unit?** The idea of standards – what does DOYA look like but also what does progress look like? What are

	the different routes that children might take? What does challenge look like?

DOYA Exemplification

What will this look like for different subjects? Even if this cannot be gained in the amount needed by the end of Term 6, the curators should be able to gather some examples from their own classes for some of the curriculum. I think this will need to be an electronically shared document which only the curators can edit but all teachers can access. The curators can then build this over time. This means, they will need some time in Term 1 and throughout the year to build this up. Teachers can use it together at FNN 2 and FNN 6 ready for assessing. The exemplars need to be for each of these criteria and acknowledge that there might be different routes to all of them. Annotation of the examples will make this clear (in the manner of exam board exemplification). Year 6 exemplars will be useful – SW is supporting with this. All exemplification will be used for training at all levels – teachers assessing their students, SLT understanding of what they should see in classrooms, books etc.

- Deepening (D): describes a child who has reached the year group expectation and is now taking this deeper into more abstract work. These children are following their passion within a broad curriculum that inspires the full range of attainment and interest.
- On track/Working at current age related expectation (O): describes a child who is working at the age related expectation and fulfils all the descriptors.
- Yet to be on track (Y): describes a child who shows some working at age related expectations by fulfilling some of the descriptors, but is not yet on track to achieve all of them.
- At an earlier stage in their learning journey (A): describes a child who working at a level below the age related expectation, typically around a year behind.