Curriculum Overview: Computer Science

Our intent is to:

- Develop imaginative, inquisitive learners who are disciplined and resilient in the face of challenges.
- Develop learners who collaborate, communicate and challenge one another with mutual respect and tolerance.
- Instil a belief that all students can achieve and enjoy computer science and ensure that students recognise the value these skills hold for life beyond school.
- Develop learners who are responsible, competent, confident and creative users of ICT.
- Through support and scaffolding, all students will be able to acquire this knowledge and develop these skills, regardless of starting point or special educational needs or disabilities.

Pre-GCSE

We now have our own web server up and running. This means that students' work will now be practical rather than theoretical and will sharpen their awareness of audience as they will now be able to share the content that they have created. The web server massively increases our options including in the use of languages and as a result of this development the whole curriculum is undergoing review, testing and redevelopment.

All students will be equipped with the skills they need for working life; those who choose to continue Computer Science at GCSE will have established a solid foundation in programming.

What we study in Year 7 and why we study it	Concepts	Competencies	Literacy/numeracy

Safety online; introduction to the FHS computers; Microbit programming. Along with becoming familiar with the basics that they will use throughout their time at FHS, students move from user to creator from day one.	Programming	Microbit programming	Literacy will be covered using keywords to introduce new vocabulary, a dictionary of computing terms.
Digital literacy project using Word and PowerPoint on Office 365. It is important to teach this aspect of digital literacy early on in students' time at FHS essential as other subjects rely on students being able to use these programmes.	Digital literacy	Use of Word Use of Powerpoint Use of Office 365	Students will write paragraphs, consider summarising into bullet points to create presentation
Faking it: digital literacy and Photo Shop This unit continues to develop students' digital literacy skills as well as their critical thinking as consumers of digital media. It supports their later work on web design.	Digital literacy Critical thinking	Use of Photoshop	Numeracy will be covered in games programming. Introduction to coordinates in all four quadrants. Negative numbers to enable movement of characters. Simple logic using AND, OR and NOT will be introduced. Addition, subtraction and multiplication will all be encountered. Binary will be introduced as a simple way of data representation, for example how it is used in images. Simple conversion using a calculator in binary and decimal mode.
Games programming in Scratch This further develops students' understanding of programming. Scratch enables students to explore the key components of programming with graphical representations rather than an abstract coding language. This, combined with the accessible drag and drop format, reduces cognitive load and allows a focus on the key components.	Key components of programming	Programming using Scratch	
Computers: the basics This units introduces students to the physical components of a computer, preparing them for deeper study at GCSE.	Physical components	Identify different components	
Introduction to HTML	HTML Web server	HTML programming	

By using a client rather than a web server, students experience the limitations of the client and therefore the importance of the web server.			
What we study in Year 8 and why we study it	**Concepts**	**Competencies**	**Literacy/numeracy**

Visual programming This further develops students' understanding of programming. Students use the developer mode in Microsoft Word, using visual basic, which gives them an opportunity to programme in a visual environment. This expands the understanding of programming that students have built in year 7.	Programming in a visual environment	Programming using visual basic Using the developer mode in Microsoft Word	Literacy will be covered using keywords to introduce new vocabulary, a dictionary of computing terms.
Digital Literacy Project This project, carried out in collaboration with Foresters' Forest, builds upon students' understanding of visual programming and introduces new components of digital literacy in a larger project.	Digital literacy Visual programming	Visual programming	Students will write paragraphs, consider summarising into bullet points to create presentation
Intermediate HTML programming This builds upon the introduction to HTML by shifting the focus from the output to the language itself. Students learn more about what the language does, as well as having more independence.	HTML	HTML programming	Keywords from various languages will be used. Accuracy in the use of keywords will be key to creating successful programs.
Programming: Javascript or Python This unit focuses on the theoretical basis of programming. **Computer Basics Level 2** **Mythbusters: internet searching** This unit focuses on ethical and cautious internet use, as well as online safety – essential life skills for all students.	Programming Digital literacy On-line safety	Javascript or Python programming Safe internet searching	Numeracy will be covered in programming. Simple logic using AND, OR and NOT will be introduced. Addition, subtraction, multiplication and division will all be encountered. Basic algebra will be covered in the use of variables and assignment. Binary will be introduced including basic addition of two binary numbers and the conversion between

| | | | different bases such as denary and hexadecimal |
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GCSE

What we study at GCSE	Concepts	Competencies	Literacy/numeracy
Term 1 will focus on logic for use in programming languages and how it is implemented on chips and processors. They will learn the basics of NOT, AND, OR and XOR logic gates and will investigate the function of a half-adder to perform binary addition with a carry and overflow. We shall look at how numbers and strings are stored (and handled). Strings will need to be concatenated and indexed. Numbers will include Integer and real types. We shall also look at modulus (performing division with quotients and remainders). There will be some cross over to mathematical techniques.	Boolean Logic Units Data Storage – numbers Data Storage – characters Computational Thinking Practical programming	Basics of NOT, AND, OR and XOR logic gates. Strings will need to be concatenated and indexed	Programming Languages: We will be using the following languages: - Python - PHP - HTML - SQL
Term 2 will look at the storage larger files such as images, sound and video. We shall look at how to calculate the file size from given parameters such as image size and colour depth, sample-size and frequency in sound and frame rate in video. Compression will investigate how we can reduce the size of these files for transmission across a medium and how some compression techniques lose/maintain quality of the original file.	Data Storage – images Data Storage – sound Data Storage – compression Designing, creating and refining algorithms Practical programming	how to calculate the file size from given parameters Compression techniques	There will be no practical project in J277. Programming knowledge will be tested as part of the written exam component. The exam board have issued a definitive guide to pseudocode that students must adhere to. Pseudocode does not follow the structure of a
Term 3 will concentrate on the CPU, the components of the CPU and how they interact together. Students will need to learn the Fetch-Decode-Execute cycle where contents are fetched from primary memory on the system busses, decoded via their opcode and operand before being executed. Students will learn simple Assembly code using the Little Man Computer Mnenomics and will have an appreciation of how a low level	Architecture of the CPU CPU performance Programming fundamentals Data types	Fetch-Decode-Execute cycle Assembly code using the Little Man Computer Mnenomics Compare different computers	single language and will include features across a range of languages, therefore students will learn both Python and PHP concurrently and will relate the learning of the

language works. Students will also be able to compare different computers with respect to their memory size, storage capacity and type and how frequency and nuber of cores of a cpu will affect the performance.			languages to the production of pseudocode.
Term 4 will build on term 3 with respect to storage and memory and the use of the CPU. This will be extended to embedded systems such as microwaves, washing machine, car engine management systems as computers in their own right	Embedded Systems Primary storage (memory) Secondary storage Programming fundamentals Additional programming techniques		HTML & SQL are web-based technologies. Students will learn HTML & PHP to give a solid grounding in modern practices of web based server-side programming. In conjunction with the use of SQL (a database language) they will acquire skills well beyond the scope of the course and useful in the workplace. SQL as a language will be tested in the exam. Students will have practical experience of using SQL as a language embedded in PHP, as a language in its own right by using phpMyAdmin as an interface to issue commands.
Term 5 will build on the techniques of term 4 and will introduce networks and some network components such as cables, suppliers. We shall also look at the topologies (shape) of networks and begin to understand the role of clients and servers in a network. This concept will formalise the programming techniques that have been employed on the webserver with both PHP and SQL	Secondary storage Network and topologies Additional programming techniques Practical programming skills	Formalise the programming techniques that have been employed on the webserver with both PHP and SQL	
Term 6 will build on knowledge of networks from term 5. We shall look at both wired and wireless networks, how they function and be able to relate to their own systems at home. We shall look at layers, the necessary steps by software and	Network and topologies Wired and wireless networks, protocols and layers		Literacy will be tested in the examination through an extended piece of

hardware to build, manage, code, transmit, receive data in a networked environment. We shall also look at the different protocols used in transmitting and receiving data across a network, for example http (unsecure transmission) & https (secure transmission) of data in a browser, ftp for managing files across computers and more.	Additional programming skills Practical programming skills Exam prep Year 10 Exam	Identify the threats and produce policies to prevent vulnerabilities Checking user input before it is processed	writing on the cultural, legal, environmental and ethical aspects of computers and computing. Numeracy will be tested in the examination through complex logic gates, basic algebraic equations as part of a program and directly using binary
Term 1 will learn about the threats that are posed to computer systems and networks such as viruses, trojans, people. They will be able to identify the threats and produce policies to prevent vulnerabilities such as secure passwords, working policies such as the restriction of using USB memory sticks on an organisations computers. In programming they will learn the essence of defensive design, checking user input before it is processed – for example checking the user has sufficient access rights, sanitising inputs to prevent malicious sql injection techniques.	Threats to computer systems and networks Identifying and preventing vulnerabilities Operating Systems Testing Defensive design	How to defragment a disk, use anti-virus software, use compression software how we can use IDEs and their facilities to aid programming including debugging programs	
Term 2 will focus on utility software in operating systems. How to defragment a disk, use anti-virus software, use compression software. The term will also look at the ethical, legal, cultural and environmental impact of computers. We will look at the law such as the Computer Misuse Act and Data Protection (GDPR). How different cultures may react to the choices we make as programmers, the digital divide between the haves and the have nots. We shall also look at the environmental impact from the mining of raw materials, power consumption and disposal of outdated machinery. In programming we shall look at the development environment of several languages and how we can	Utility software Ethical, legal, cultural and environmental impact Testing Languages The Integrated Development Environment (IDE)		

use IDEs and their facilities to aid programming including debugging programs.			
Term 3. From this term onwards we shall revise both the theoretical and practical aspects of the course.	Programming revision Searching and sorting algorithms Searching and sorting practical programming skills Mocks Theory revision Practical programming skills revision Theory revision Practical programming skills revision		