

Year 8 Standards - COMPUTER SCIENCE

Knowledge/skills	Working towards SWGS Standard for end of Year 8	Working at SWGS Standard for end of Year 8	Working beyond SWGS Standard for end of Year 8
Computer Science - theory and concepts, programming using a range of languages and computer systems	Data Representation – Images and Sound In this unit, learners will focus on digital media such as images and sounds, and discover the binary digits that lie beneath these types of media. Just like in the previous unit, where learners examined characters and numbers, the ideas that learners need to understand are not really new to them. You will draw on familiar examples of composing images out of individual elements, mixing elementary colours to produce new ones, and taking samples of analogue signals, to illustrate these ideas and bring them together in a coherent narrative. This unit also has a significant practical aspect. Learners will use relevant software (GIMP and Audacity, in this case) to manipulate images and sounds and get an idea of how the underlying principles of digital representations are applied in real settings. This unit builds on the material from the Year 8 unit, ‘Representations: from clay to silicon’.		
	- Describe how digital images are composed of individual elements - Recall that the colour of each picture element is represented using a sequence of binary digits - Define key terms such as ‘pixels’, ‘resolution’, and ‘colour depth’ - Describe how an image can be represented as a sequence of bits - Recall that sound is a wave - Define key terms such as ‘sample’, ‘sampling frequency/rate’, ‘sample size’ - Define ‘compression’, and describe why it is necessary	- Describe how colour can be represented as a mixture of red, green, and blue, with a sequence of bits representing each colour’s intensity - Compute the representation size of a digital image, by multiplying resolution (number of pixels) with colour depth (number of bits used to represent the colour of individual pixels) - Describe the trade-off between representation size and perceived quality for digital images - Describe how sounds are represented as sequences of bits	- Explain the function of microphones and speakers as components that capture and generate sound - Calculate representation size for a given digital sound, given its attributes - Explain how attributes such as sampling frequency and sample size affect characteristics such as representation size and perceived quality, and the trade-offs involved

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	Computer Networks Imagine a world without computer networks, and how different your life would be. There would be no more YouTube, Google, instant messaging, online video gaming, Netflix, and iTunes. There would be no online shopping, or quickly looking up directions to a location at the click of a button. There would be no more sharing of files or peripherals such as a printer, and no more central backups of information. As networks have evolved, society has become increasingly reliant on the services that they provide. They have changed the way we learn, work, play, and communicate. This unit begins by defining a network and addressing the benefits of networking, before covering how data is transmitted across networks using protocols. The types of hardware required are explained, as is wired and wireless data transmission. Learners will develop an understanding of the terms ‘internet’ and ‘World Wide Web’, and of the key services and protocols used. Practical exercises are included throughout to help strengthen understanding.		
	• Define what a computer network is and explain how data is transmitted between computers across networks • Define ‘protocol’ and provide examples of non-networking protocols • List examples of the hardware necessary for connecting devices to networks • Define ‘bandwidth’, using the appropriate units for measuring the rate at which data is transmitted, and discuss familiar examples where bandwidth is important • Define what the internet is • List some of these services and the context in which they are used	• Compare wired to wireless connections and list examples of specific technologies currently used to implement such connections • Describe key words such as ‘protocols’, ‘packets’, and ‘addressing’ • Explain the difference between the internet, its services, and the World Wide Web • Describe how services are provided over the internet • Describe how internet-connected devices can affect me	• Explain how data travels between computers across the internet • Explain the term ‘connectivity’ as the capacity for connected devices (‘Internet of Things’) to collect and share information about me with or without my knowledge (including microphones, cameras, and geolocation) • Describe components (servers, browsers, pages, HTTP and HTTPS protocols, etc.) and how they work together

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	Python Programming with Sequences of Data This unit introduces learners to how data can be represented and processed in sequences, such as lists and strings. The lessons cover a spectrum of operations on sequences of data, that range from accessing an individual element to manipulating the entire sequence. Great care has been taken so that the selection of problems used in the programming tasks are realistic and engaging: learners will process solar system planets, book texts, capital cities, leaked passwords, word dictionaries, ECG data, and more. A range of pedagogical tools are employed throughout the unit, with the most prominent being pair programming, live coding, and worked examples.		
	• Write programs that display messages, receive keyboard input, and use simple arithmetic expressions in assignment statements • Use selection (if-elif-else statements) to control the flow of program execution • Locate and correct common syntax errors • Create lists and access individual list items • Perform common operations on strings or individual characters • Perform common operations on lists or strings	• Perform common operations on lists or individual items • Use iteration (while statements) to control the flow of program execution • Perform common operations on lists or individual items • Use iteration (for statements) to iterate over list items • Use iteration (for loops) to iterate over lists and strings • Use variables to keep track of counts and sums • Combine key programming language features to develop solutions to meaningful problems (with support)	• Combine key programming language features to develop solutions to meaningful problems (independently)

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Digital Literacy - being a safe and responsible digital citizen	Cyber Security This unit takes the learners on an eye-opening journey of discovery about techniques used by cybercriminals to steal data, disrupt systems, and infiltrate networks. The learners will start by considering the value of their data to organisations and what they might use it for. They will then look at social engineering techniques used by cybercriminals to try to trick users into giving away their personal data. The unit will look at the more common cybercrimes such as hacking, DDoS attacks, and malware, as well as looking at methods to protect ourselves and our networks against these attacks.		
	- Identify what happens to data entered online - Recognise how human errors pose security risks to data - Define hacking in the context of cyber security - Identify strategies to reduce the chance of a brute force attack being successful - List the common malware threats - Identify the most effective methods to prevent cyberattacks	- Explain the difference between data and information - Explain the need for the Data Protection Act - Implement strategies to minimise the risk of data being compromised through human error - Explain how a DDoS attack can impact users of online services - Explain the need for the Computer Misuse Act - Compare security threats against probability and the potential impact to organisations - Explain how networks can be protected from common security threats	- Critique online services in relation to data privacy - Examine how different types of malware causes problems for computer systems - Question how malicious bots can have an impact on societal issues
ICT - The use of application software such as PowerPoint, Excel and Word	Spreadsheets In this unit, learners will gain an understanding and knowledge of how to use spreadsheets to store and manipulate data, how to use common functions, and how to extract data to create visual representations using charts. Learners will use spreadsheets to track and calculate income, make predictions, and answer “what if...” questions. It is assumed that learners have had some experience of spreadsheets at KS3 level and therefore know how to use cell references, fill colours, and borders, and are familiar with the basic functions, e.g. SUM, AVERAGE, MAX, and MIN.		
	- Create a spreadsheet model for a given scenario - Demonstrate how to use formulae to perform calculations - Apply cell formatting - Implement formatting to make the spreadsheet readable and to highlight different specific information	- Use data validation when entering data in order to reduce user error - Implement conditional formatting techniques - Format cells correctly, e.g. cells representing money should be currency, etc. - Recognise the importance of clear titles and labels	- Demonstrate that skills developed in the lessons can be applied to a different scenario - Solve problems using transferable skills - Implement and test a macro to carry out a repetitive task

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	• Select the most suitable chart to visualise the selected data	• Implement an IF function to give the user feedback • Implement a LOOKUP function to retrieve data	